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Original investigation

Health Warning Labels for Smokeless Tobacco: The Impact of Graphic Images on Attention, Recall, and Craving

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Abstract

Introduction: Little research has examined the impacts of graphic health warnings on the users of smokeless tobacco products.

Methods: A convenience sample of past-month, male smokeless tobacco users (n = 142; 100% male) was randomly assigned to view a smokeless tobacco advertisement with a graphic health warning (GHW) or a text-only warning. Eye-tracking equipment measured viewing time, or dwell time, in milliseconds. Following the advertisement exposure, participants self-reported smokeless tobacco craving and recalled any content in the health warning message (unaided recall). Linear and logistic regression analyses evaluated the proportion of time viewing the GHW, craving, and GHW recall.

Results: Participants who viewed a GHW spent a significantly greater proportion of their ad viewing time on GHWs (2.87 seconds or 30%), compared to those viewing a text-only warning (2.05 seconds or 24%). Although there were no significant differences by condition in total advertisement viewing duration, those participants viewing a GHW had increased recall of health warning messages compared to the text-only warning (76% had any warning message recall compared to 53%; $p < .05$). Self-reported craving after advertisement exposure was lower in the GHW compared to text-only condition, but the difference was not statistically significant (a rating of 4.4 vs. 5.3 on a 10-point scale; $p = .08$).

Conclusions: GHWs attracted greater attention and greater recall of health warning messages compared to text-only warnings among rural male smokeless tobacco users.

Implications: Among a sample of rural smokeless tobacco users, GHWs attracted more attention and recall of health warning messages compared to text-only warnings when viewed within smokeless tobacco advertising. These findings provide additional empirical support that GHWs are an effective tobacco control tool for all tobacco products and advertisements.

Introduction

While cigarette use has declined over the past decade in the United States, smokeless tobacco (SLT) use has remained steady, with roughly 9 million adults (7%) reporting some past month use.[1] In the Midwest and the South of the United States, SLT use is more prevalent, with 9% of adult males reporting current SLT use (and 0.4% of adult females reporting current SLT use).[2] Ohio is a region with higher rates of smoking, smokeless, and dual use of tobacco products[3]; the highest rates are observed within the rural, Appalachian counties of the state.[4,5] With complex environmental, psychological and social influences that portray tobacco products as traditional and normative,[6–9] coupled with fewer tobacco control restrictions in place, Ohio Appalachian residents are likely exposed to greater amounts of tobacco use and pro-tobacco marketing; all these factors are known to promote tobacco use.[10]

Although SLT is less lethal than combustible tobacco products, SLT causes cancer and other health problems.[11] To inform consumers about the risks of tobacco products, graphic health warnings (GHWs) are required on tobacco product packaging in over 92 countries globally.[12] Prior to the passage of the Family Smoking Prevention and Tobacco Control Act (referred to as the TCA), [13] health warnings in the United States consisted of small text-based warning messages printed on cigarette and SLT product packaging and advertisements. The TCA mandated GHWs for cigarette packages and advertisements (which, to date, have been held up by legal challenges), as well as larger text-based warnings for SLT. Starting in summer 2010, the TCA required SLT manufacturers to rotate one of four text-based warning messages which must occupy at least 30% of product packaging and 20% of product advertisements. The TCA also provided the Food and Drug Administration (FDA) with the authority to revise the SLT warnings, including by adding GHWs, if it finds that "such a change would promote greater public understanding of the risks associated with the use of SLT products."[13]

Observational and experimental studies have been conducted on health warning messages on tobacco products and advertisements, with a near exclusive focus on cigarettes[14,15]; results have consistently demonstrated that pictorial (or graphic) warnings are more effective than text-only warnings in attracting consumers' attention, increasing health knowledge and risk perceptions, and promoting smoking cessation.[15] Warnings on products and advertisements reduce the positive smoking cues, including craving.[16,17] Although less research has focused specifically on warnings pertaining to SLT and other non-cigarette tobacco products, evidence continues to accumulate demonstrating that (1) GHWs attract attention to the health-relevant text that accompanies the graphic images, and (2) this attention facilitates the processing of warning label information,[18–21] increases perceived risks of SLT,[22] and reduces interest in trying novel SLT products like snus.[23] Additional research is needed to further evaluate both the effectiveness of current SLT warnings within advertisements, and the potential impact of revising the warnings to include a graphic component.

One means to better understand consumer reactions to GHWs (and the effectiveness of GHW characteristics) is through research using eye-tracking equipment, which allows for detailed capture of precise eye movements when an individual is exposed to visual stimuli.[24] A limited number of eye-tracking studies have focused on GHWs on cigarette packaging and demonstrated that graphic images draw greater attention than non-graphic warnings.[25,26] Other studies, however, have found that smokers avoid warnings placed on product packaging.[27–29] No known eye-tracking studies have examined GHWs embedded in SLT advertisements; thus it is not known whether SLT users will yield dissimilar responses to GHWs, compared to smokers.

The purpose of this study was to evaluate the attention paid to GHWs compared to text health warning labels embedded within SLT advertisements to assess their impacts among a vulnerable population of Ohio Appalachian users. Our primary hypothesis was that SLT users exposed to GHWs would demonstrate increased attention and recall and decreased SLT craving when compared to those exposed to text-only warnings.

Methods

Participants

Data were gathered as a part of the Ohio Health Warning Label (OHWL) study on SLT users within a rural, underserved region (Ohio Appalachia) between December 2013 and December 2014. A convenience sample was recruited using flyers and brochures. A phone screening determined if participants met study eligibility criteria: use of SLT at least 1 day in the past month, males aged 18 or older, and living in one of the 32 counties designated as a part of Ohio Appalachia; dual users of other tobacco products were eligible. Participants were excluded if they had a history of certain eye conditions, such as macular degeneration, glaucoma, or cataracts, which are known to interfere with eye-tracking assessment. Participants who completed the experiment received a $50 gift card; those unable to be calibrated on eye-tracking equipment received a $10 gift card.

Procedures

All research sessions were conducted in private areas within an office environment. Trained interviewers explained the study and obtained signed informed consent. Participants were seated comfortably in a chair within a typical viewing distance (24–32 inches) from a 17-inch LCD monitor equipped with the eye-tracking system (SensoMotoric Instruments REDm 250; Berlin, Germany) refreshing at 60 Hz. Participants underwent a 9-point calibration procedure three times to ensure data quality before initiation of the experiment.

Participants were instructed to imagine they were flipping through a magazine while they moved at their own pace through the experiment, answering an on-screen question after each advertisement in order to re-center and standardize a participant's gaze between advertisements. Each participant viewed a total of seven advertisements; one SLT advertisement (fixed at fourth in the series) and one cigarette advertisement with a text-only warning ("WARNING: Smoking During Pregnancy Can Harm Your Baby," fixed at seventh in the series); five others were shown in random order for common consumer products; see Table 1 for the chosen brands, corresponding survey items, and response categories for each on-screen survey question.

The SLT brand selected for this experiment was based on it not being popular among users in Appalachian Ohio (Wewers ME et al., unpublished data, January 2012), and an advertisement was selected that featured simple graphic and text imagery; a modified advertisement with branding removed is shown in Figure 1. Preference for a less popular brand was intended to minimize differential attention and recall that may result from a tobacco user's brand loyalty.[27,30] In the present study, participants were randomly assigned to one of two conditions with a health warning covering 20% of an SLT advertisement: (1) a control condition using one of four TCA-mandated text-based warnings, or (2) an intervention condition using one of four TCA-mandated text-based warnings plus a graphic image. Both conditions

Table 1. Product Advertisements and Post-Advertisement Survey Items from the Ohio Health Warning Label (OHWL) Study

Product	Brand	Post-advertisement survey item	Response categories
USB drive	iFlash drive	I feel confident using technology.	1–10 scale from strongly disagree to strongly agree
Orange juice	Tropicana	There is at least one full serving of fruit in 100% juice.	1–10 scale from strongly disagree to strongly agree
Macaroni and cheese	Kraft	This product is a healthy choice for my family.	1–10 scale from strongly disagree to strongly agree
Smokeless tobacco	Rooster	I am craving smokeless tobacco right now.	1–10 scale from strongly disagree to strongly agree
Energy drink	5-h energy	This product is a safe way to boost my energy.	1–10 scale from strongly disagree to strongly agree
Alcohol	Jose Cuervo	This advertisement is meant for people who are…?	<18, 18–20, ≥21 y old
Cigarettes	American spirit	I am craving a cigarette right now.	1–10 scale from strongly disagree to strongly agree

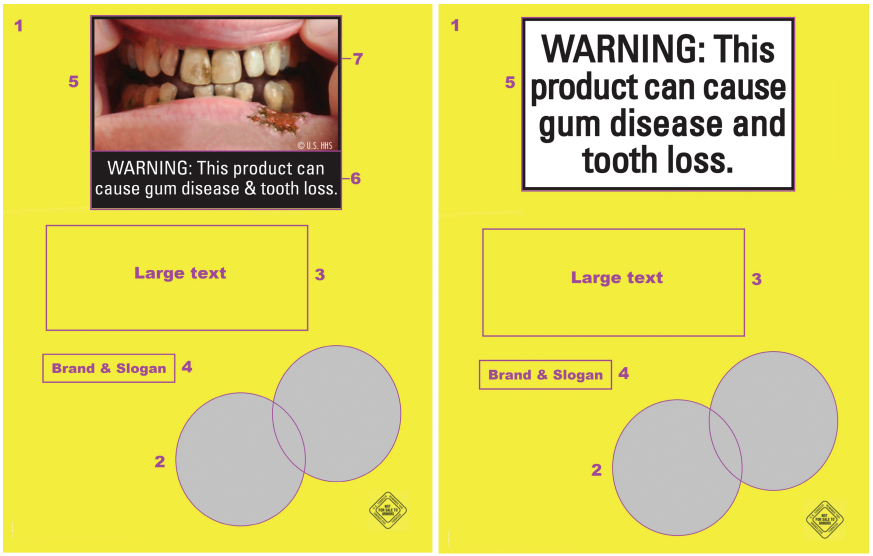

Figure 1. Graphic and text-only health warning on experimental advertisement (branding removed) to show identified areas of interest (AOIs): (1) whole advertisement, (2) smokeless tobacco product tins, (3) large block of text, (4) small block of text, (5) entire warning label, (6) warning text, and (7) graphic image.

were equivalent in size; thus the size allocated to the non-warning-label portion of the advertisement was fixed across both conditions. Post-experiment, a survey was administered by a trained interviewer; the entire protocol took approximately 45 minutes to complete. The study protocol was approved by the university Institutional Review Board.

The planned sample size (n = 70 per study condition) was estimated based on the primary outcome, the proportion of dwell time on GHWs and the modest differences reported in previous research.[25] This sample size was inflated by 5% to account for individuals who are unable to be successfully calibrated to the eye-tracking equipment. A third of all participants were randomized to a secondary control condition where the warning was a smaller text-only seal; however, the primary study hypotheses were to compare the larger warning labels (text-only vs. graphic image) and, thus, results from this secondary control are not reported here.

Measures May

Eye-Tracking Measures

BeGaze software was used to display the experimental stimuli (advertisements) and capture the eye-tracking data. For the purpose of this analysis, the term "warning label" refers to the box containing all warning content, whether text-only or text plus graphic imagery, "warning text" refers to only the textual message portion of a warning label, and "graphic image" refers to only the visual imagery of a warning label. The primary outcome measure was the proportion of dwell time (analyzed in milliseconds, reported in seconds for ease of interpretation) as a measure of attention on the GHW portion of the advertisement. These areas of interest (AOIs) were defined a priori for all advertisements viewed. In particular, AOIs were drawn for the warning label and the SLT advertisement itself (the non-warning label space); an example of the study conditions is shown in Figure 1. These AOIs included the (1) whole advertisement, (2) SLT product tins, (3) large block of ad text, (4) small block of ad text, (5) entire warning label, (6) warning text, and (7) graphic image. For each AOI listed above, the following were measured: (1) the duration of dwell time in seconds, (2) the proportion of total viewing time on the AOI (calculated based on the duration of dwell time on the AOI divided by total dwell time on the advertisement), (3) the first AOI to be viewed, referred to as the first fixation, and (4) total visits, measured as the sum of all views to the AOI after a participant's initial viewing.

Survey Measures

Planned secondary analyses were gathered through self-reported surveys. Craving was self-reported by participants immediately following exposure to the SLT advertisement. Modified from a single item developed by Shiffman et al.,[31] participants were asked, "I am craving SLT right now," anchored between strongly disagree to strongly agree on a scale of 1–10 (see Table 1). Following exposure to the cigarette advertisement, participants were asked to rate their craving for cigarettes on a scale of 1–10 (strongly agree to strongly disagree) in response to the item, "I am craving cigarettes right now."[32]

Recall of the health warning label was determined by a series of questions post-experiment (eg, "What do you remember about the smokeless advertisement? You can describe any pictures you remember and all of the words you can recall.") No visual aids were given to participants as a recall aid, and field staff recorded participant responses verbatim. Two trained coders (SEK, AB) reviewed all of the responses independently and consensus meetings were held to resolve coding disagreements. Coders used responses within any of the series of post-experimental questions to assess whether a participant provided a description of the gist of the warning text or imagery that could be considered as "any recall" (eg, describing "the man with the hole in his throat" or "smoking kills"). Coders treated other responses that made no reference to imagery or wording in the specific warning as no recall. The kappa coefficient for interrater reliability of recall coding was very high, ranging from 88% to 100% (95% confidence interval of 80%–100%).

Additional measures for descriptive purposes were captured by self-report during the screening process, the experiment, and post-experiment. Items included demographic factors of age, race/ethnicity, annual household income, and marital status. Behavioral factors included age of SLT initiation (in years), a history of quitting SLT for at least 24 hours (yes/no), and SLT dependence using the Fagerström test for nicotine dependence (FTND-ST).[33]

Analysis

To evaluate differences in attention, all analyses used the proportion of dwell time in milliseconds on specific AOIs as measured by the eye-tracking equipment. Differences in continuous outcome measures were assessed via general linear regression for the primary comparison. No gross violations of the equal variance assumption were found in any of the continuous variables assessed. To evaluate difference in any recall of warning messages, we used logistic regression and reported the proportion of participants reporting any recall. Effect size estimates are reported as semipartial eta-square for continuous measures, and as odds ratios for dichotomous measures.

Statistical significance was set at alpha = 0.05. The primary comparison examined the proportion of dwell time on the warning label whereas other (highly correlated) outcomes were considered secondary; therefore, no adjustments have been made for multiple comparisons. Data were analyzed using SAS 9.3 (SAS Institute, Inc.; Cary, NC).

Results

Participant characteristics are described in Table 2, and there were no significant differences in these demographics between the study conditions. On average, study participants were 35 years old, lived in a 3-person household, and most (63.7%) had health insurance. Compared to the local population in Ohio Appalachia, participants were slightly younger, had lower incomes, and were less likely to have health insurance.[34,35] These characteristics are generally consistent with the profile of SLT users.[36] The majority (61%) reported using the most popular brand of SLT, called Grizzly; none reported use of the brand used in the experiment.[37] Study participants had a mean SLT dependence score of 4.3 (out of 19) representing a lower level of nicotine dependence,[33] 61% had ever made a serious attempt to quit using SLT, and most participants dual-used SLT and cigarettes (85%).

Participants viewed the SLT and cigarette advertisements for roughly 8–10 seconds on average (see Table 3). Although there was no significant difference in the total dwell time on the SLT advertisement between conditions, participants in the GHW condition gave the AOI of the warning labels significantly more attention (in total dwell time and proportion of dwell time) compared to the text-only control

Table 2. Descriptive Characteristics of Male Appalachian Smokeless Tobacco (SLT) Users from the Ohio Health Warning Label (OHWL) Study

OHWL study (n = 142)	Text-only (20%) (n = 72)	Graphic (20%) (n = 70)
Demographics		
Mean age (*SD*) (in years)	35.0 (12.8)	35.2 (13.5)
Mean (*SD*) household size	3.2 (1.9)	2.8 (1.4)
% Household income		
<$15 000	29.2%	31.4%
$15–$24 999	29.2%	31.4%
$25–$34 999	22.2%	22.9%
$35–$49 999	13.9%	7.1%
≥$50 000	5.6%	7.1%
% Education		
<High school	31.9%	32.9%
High school	43.1%	52.9%
>High school	25.0%	14.3%
Has health insurance	63.9%	54.3%
Tobacco use behaviors		
Mean (*SD*) SLT dependence score (0–9)	4.3 (1.8)	4.3 (1.9)
% (n) Ever made serious SLT quit attempt	61.1%	61.8%
Smoked at least 100 cigarettes in lifetime	90.3%	92.9%
Current dual user	84.7%	85.7%

Table 3. Means, Proportions and Odds Ratios for Attention and Reactions to a Smokeless Advertisement from the Male Users in the Ohio Health Warning Label (OHWL) Study

OHWL study (n = 142)	Text-only (20%) (n = 72)	Graphic (20%) (n = 70)
Seconds of dwell time (CI)		
Comparison alcohol ad	6.34 (5.52–7.16)	6.42 (5.59–7.26)
Comparison cigarette ad	10.85 (9.12–12.58)	10.01 (8.26–11.78)
Smokeless tobacco ad	8.75 (7.68–9.83)	9.88 (8.75–11.02)
Product tins	1.71 (1.41–2.02)	1.66 (1.14–1.98)
Ad text (large)	2.50 (2.12–2.88)	2.71 (2.29–3.13)
Ad text (small)	0.63 (0.48–0.79)	0.58 (0.42–0.73)
Warning label	2.05 (2.08–2.73)	2.87 (2.70–3.36)**
Proportion of dwell time on warning label	24.0% (20.8–27.3)	30.3% (27.0–33.6)**
Odds ratio for first fixation on warning label	Reference	1.27 (0.54–2.99)
Mean views of warning label	2.09 (1.81–2.38)	2.07 (1.79–2.35)
Reactions		
Odds ratio for any warning recall	Reference	2.79 (1.36–5.71)**
Craving rating (0–10) after ST ad exposure	5.28 (4.57–5.98)	4.38 (3.67–5.10)
Craving rating (0–10) after cigarette ad exposure	5.68 (4.95–6.44)	5.17 (4.41–5.93)

CI = confidence interval.
**$p < .05$.

(2.87 seconds at 30% dwell time versus 2.05 seconds at 24% of dwell time; $\eta^2 = 0.06$ and 0.05, respectively). Nearly all participants viewed the entire health warning label (94% and 100%, respectively; $p = .046$). The odds of any recall of health warnings was 2.79 times higher among those viewing the GHW, compared to those in the text-only warning (CI: 1.36–5.71; $p < .0006$). Self-reported craving after advertisement exposure was lower in the GHW condition compared to text-only condition (a rating of 4.4 vs. 5.3 on a 10-point scale), but the difference was not statistically significant ($p = .082$).

Discussion

Study findings support the value of including pictorial imagery within warning messages, as study participants viewing GHWs had significantly greater recall of the warnings compared to those viewing text-only labels. Specifically, our results are consistent with numerous studies on cigarette products and advertisements that demonstrate increased attention and recall to graphic compared to text-only warnings.[15,26,28,29,38–40] This finding is also consistent with the Framework Convention on Tobacco Control recommendation for using GHWs on all tobacco products.[41] As noted by Chaloupka et al.,[42] GHWs have substantial economic benefits to public health, and that the FDA should target specific populations, such as rural residents, to evaluate how these vulnerable groups may be differently impacted. Our study provides a valuable contribution to the limited literature focused on rural smokers and SLT warnings. As public health and medical professionals call for use of GHWs on SLT products,[43] our study provides further evidence of increased recall of GHWs compared to text-based warnings. Numerous other studies have demonstrated that GHWs on cigarette products produce several public health benefits through increased visibility, including a reduction in tobacco product appeal and an increase in quit intentions.[9,14,40,44–46]

Noticing a warning is a key first step needed for an individual to encode the health warning messages, comprehend it, and ultimately change behavior.[20,47] Yet, all users may not notice warnings equally; important disparities exist in attention to text-based warnings among SLT users, as reported exposure to current warning labels is lowest among individuals with lower education and income.[48] These disparities underscore the potential benefit of adding pictorial imagery to SLT warnings in order to better attract the attention of the most vulnerable tobacco users. Further, while the TCA specifies cigarette warnings to be at the top of advertisements, this placement location was not specified for SLT advertisements; in the experimental stimuli, warnings were placed at the top of advertisements to be consistent with placement for cigarette GHWs. Yet, in a content analysis of SLT advertisement imagery within five popular magazines, 86 unique advertisements from five SLT brands found text warnings placed at the bottom of SLT advertisements (Keller-Hamilton et al., unpublished data, August 2016), assumedly an intentional choice to minimize attention to the warning. All told, the inclusion of pictorial imagery and warning placement are critically relevant to attracting consumer attention to affect attitudes and behaviors toward the product.[49]

The present research has some important limitations to note. It included only males, as very few (0.4%) women use SLT.[2] Future studies should consider other vulnerable tobacco users including youth, young adults, and others in high risk groups. The present recall coding strategy focused on gist memory for the health warning, rather than verbatim recall; future studies could evaluate verbatim recall and comprehension, or differentiate between recall of text message and/or warning imagery to examine these concepts in more detail. Since most study participants were dual users, overall nicotine dependence may not be sufficiently reflected by the SLT dependence scale. Future research is needed to focus on dual users, dependence, and the impacts of health warning label messages from multiple products on dual users' behaviors. Our study focused on recall of warning messages, and did not examine whether SLT warning messages affected the accuracy of risk perceptions of SLT, as well as their risk relative to cigarettes. The limited literature on SLT risk perceptions is inconclusive,[14,50] suggesting that research is warranted to directly investigate health warnings and their impacts on risk perceptions for SLT and for SLT relative to other tobacco products.

These findings provide additional empirical evidence supporting the Framework Convention on Tobacco Control's recommendation that warnings include photographic imagery.[51] Although GHWs for SLT products may also face legal challenges from the tobacco industry, this study adds to the evidence that GHWs are an effective tobacco control tool for all tobacco products and advertisements.

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Declaration of Interests

None declared.

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