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Warning Labels on Sugar-sweetened Beverages: An Eye Tracking Approach

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Abstract

Objectives: In this study, we examined visual attention of a warning label on a sugar-sweetened beverage (SSB) and its effects on visual attention to SSB product descriptors and perceptions of SSB using eye tracking technology.

Methods: We had 180 young adults view an image of a generic soda can with or without a text warning on a computer monitor.

Results: Participants spent less time looking at marketing elements on the can in the “Warning” condition compared to the “No warning” (control) condition. Compared to the control, participants in the “Warning” condition viewed the sugar-sweetened beverage as less healthy (1.78 warning vs 2.21 control, $p < .01$) and believed that drinking SSBs contributed to diabetes (5.70 warning vs 5.27 control, $p < .01$). Visual attention to warning label was associated with correct recall of the warning and opting out of purchasing the can.

Conclusions: Textual warning on SSB reduced visual attention to marketing elements on the can. Although there were few statistically significant differences between the conditions on most

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Human Subjects Approval Statement

Ethical approval was received from the RTI Office of Research Protection and all study participants provided informed consent.

Conflict of Interest Statement

The authors declare that they have no competing interests related to this publication.

measures of product appeal or risk perception, warnings increased some perceived risks of SSBs indicating that warning labels on SSBs might be a promising strategy in informing consumers, particularly young adults, about risks of added sugars.

Keywords

eye tracking; warning labels; sugar-sweetened beverages; obesity

Emerging evidence indicates that consumption of added sugars is associated with negative health outcomes like dental caries,^{1–3} obesity,^{4–6} diabetes,⁷ fatty liver disease,⁸ and cardiovascular disease.^{9,10} Sugar-sweetened beverages (SSBs) are the top source of added sugars in the diet.¹¹ SSBs are beverages with added sugars or other caloric sweeteners, for example, non-diet soft drinks (soda), sports drinks, fruit drinks, sweetened tea and coffee drinks, and energy drinks.¹²

There have been calls to inform consumers about the negative health effects of added sugars and to place warning labels on SSBs.^{13,14} In the United States (US) and other countries, tobacco and alcohol products carry warning labels about their health risks. Tobacco warning labels, particularly pictorial labels, are effective in changing perceptions, knowledge, and behavior,^{15–17} while alcohol labels increase knowledge but have little effect on changing behavior.¹⁸ To the best of our knowledge, no countries have implemented warning labels on SSBs so far. A number of US local and state jurisdictions proposed bills requiring warning labels on SSBs' containers, advertisements, and vending machines, including California, Hawaii, Massachusetts, New York State, Washington State, Baltimore, MD, and San Francisco, CA.^{19–21} However, to date, no warning labels on SSBs have appeared. Many of the proposed bills died in committees or were withdrawn. The 2015 San Francisco ordinance passed but was stalled by a lawsuit.²² The plaintiffs (American Beverage Association, California Retailers Association, and California State Outdoor Advertising Association) argued that placing a warning on advertisements for SSBs “will divert consumer attention from the balance of an advertisement, undermine consumers' perception of the advertised product, and discourage its consumption.”²³ They did not provide empirical evidence to back this claim, yet the court agreed that the proposed warning “unduly burdens and chills protected commercial speech.”²² The beverage companies' success in hampering the implementation of warning labels for SSBs is due, in part, to the limited research on the effects and perceptions of these warning labels.^{20,21}

Several experimental studies examined effects of SSB warning labels. Among US adolescents, textual warnings on SSBs decreased purchasing intentions and reduced beliefs that SSBs are healthy, increase energy, and help focus.²⁴ US parents of 6-to-11-year-old children who saw textual warning labels on SSBs believed that SSBs were less healthy for their child and were less likely to select an SSB from an online vending machine.²⁵ Among New Zealand youth and young adults, plain packaging and text and pictorial warning labels reduced preferences for and intentions for purchasing SSBs.²⁶ Similarly, various warning labels reduced purchase intentions for SSBs among Australian young adults, with pictorial warnings having the largest effect.²⁷

Much of the research has relied on self-report measures of consumer responses to warning labels on SSBs. Another way to evaluate potential effects of warnings is to employ physiological measurements of attention, such as eye tracking. Eye tracking is a technology that measures individuals' eye movements to reveal where and for how long a person is looking at a given stimuli.²⁸ Eye tracking provides an objective measure of consumers' attention to a stimuli.²⁹ Attention occurs before comprehension and changes in perceptions, intentions, and behavior and is, therefore, a critical process in studying the effects of warning labels.³⁰ Evidence from eye tracking studies has been used to educate judges in court cases about warning labels.³¹ Results of eye tracking studies might be perceived as more objective measures of the effects of the warning labels, compared to self-report of intentions and perceptions, and thus, would complement these studies.

Eye tracking technology has been used extensively in studies of warning labels on cigarette packages to demonstrate differences in attention and viewing patterns of various features of packaging and labels and to help explain the effects of the labels on self-reported outcomes, such as recall or intentions.^{32,33} To our knowledge, there have been no eye tracking studies on SSBs warning labels. Yet, this type of research will complement experimental research to provide a more compelling case for the implementation of SSB warning labels. The primary objective of our study was to use eye tracking technology to measure consumers' visual attention to SSB warning label and how this influences visual attention to other product descriptors on the can. A second objective was to analyze how visual attention to the warning label and other product descriptors is associated with aided recall of the warning, perceptions of the product, and purchase intentions. In this study, we specifically focus on young adults because they have higher consumption of SSBs than other age groups³⁴ and are aggressively targeted with SSB promotions by the beverage industry.³⁵

METHODS

Sample

This study was part of a larger investigation on tobacco users' visual attention to warning labels on little cigars and cigarillos. A local convenience sample of 180 young adults (18–34 years old) was recruited in the Raleigh/Durham area of North Carolina via advertisements on Facebook and Instagram in June 2017. To participate, respondents had to: (1) have ever smoked cigarillos or little cigars; (2) be 18 years old or older; (3) be non-Hispanic white or non-Hispanic black; and 4) agree to attend the study in person. Respondents who wore bifocals, progressive lenses, or hard contact lenses were excluded due to limitations of the eye tracking technology. First In Focus Research, Inc (FIF), a local marketing research firm, contacted qualified participants by phone to confirm eligibility and schedule interviews. FIF reimbursed participants with \$50 in cash. To obtain the sample of 180 participants, FIF scheduled 221 interviews. Of the scheduled interviews, 14 did not show up, 18 canceled, and 8 were not able to complete the interview because of problems with the eye tracking technology (81.9% completion). Participants were informed that the purpose of the study was to better understand what people pay attention to on selected study images.

Procedures

Participants sat 22–30 inches in front of a computer monitor with the SensoMotoric Instruments (SMI) Mobile Remote Eye Tracking Device, version 7.2, an automated contact-free eye tracking device, attached to the bottom of the screen. They were given a viewing task (eg, look at X's on a screen) to calibrate the eye tracking hardware to the participant's natural gaze patterns. After the calibration, each participant viewed the first tobacco products module. Data from these images are presented elsewhere.³⁶ For the second module, participants viewed 4 images of non-tobacco products one at a time in a randomized order: a soda can, a bottle of water, a pack of potato chips, and a pack of chewing gum. We used the image of a soda can because regular soda is the most heavily-consumed SSB among young adults.³⁷ Participants were randomized to one of 2 conditions. In condition 1, the image for the SSB can (adapted from a generic cola can) had a warning statement: "Warning: Drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay" (Figure 1, Figure 2). The size and appearance of the label was modeled after SSB warning labels proposed in California.³⁸ In condition 2, the can had no warning statement. Each image was displayed for 10 seconds, similar to other eye tracking studies of product warning labels.^{39–41} Participants looked away from the computer monitor after each image to answer questions about recall of information, product appeal, and purchase intentions. After the questions were completed, participants looked back at the computer monitor and pressed a designated button for the next image. Before the next image was shown, a fixation cross appeared on the screen to calibrate the eye tracking hardware. The process was repeated after each image. After seeing the 4 non-tobacco product images, participants answered questions about SSB risk perceptions and demographics and other tobacco-related questions. Upon completion of the study, the RTI staff debriefed participants about the study and addressed any questions.

Measures

Dwell time was the amount of time (in seconds) a participant looked at a particular area of interest (AOI) (eg, warning statement, cola logo). Fixations represent the number of times a participant's gaze crossed into an AOI and was stable (ie, restricted to a 100-pixel diameter space) for at least 80 milliseconds. We normalized dwell time and fixation count by multiplying the outcome by the ratio of the AOI size to the size of total can (in pixels). Specifically, normalized dwell time = dwell time * (AOI size/Can size). Similarly, normalized fixations = fixations*(AOI size/Can size). Eye movements were recorded at a sample rate of 120Hz.

We used aided warning statement recall where participants could pick one of 6 warning label statements: "None of the above" or "I don't wish to answer." Picking the warning "drinking beverages with added sugar(s) contributes to obesity, diabetes, and tooth decay" was coded as "correct recall." Picking any of 5 alternative choices (eg, "Drinking beverages with added sugar(s) increases the risk of non-alcoholic liver disease," "Added sugar(s) in soda is associated with weight gain and obesity"), "None of the above" or "I don't wish to answer" was coded as "incorrect recall." Participants also were asked if they remembered seeing additional information on the can, specifically, "Cola," "Cold, Crisp, Refreshing," and "12 FL OZ (354mL)," which correspond to other AOIs on the can containing text.

Product appeal was measured with 6 semantic differential scales, each with a 7-point continuum (eg, expensive - cheap); each was analyzed separately. A higher number represented greater product appeal. Risk perceptions were measured by asking: “Imagine that you drink soda every day. What do you think your chances are of having each of the following happen to you if you continue to drink soda every day?” with respect to the following: weight gain, heart disease, diabetes, and tooth decay. Response options included a 6-point Likert-type scale ranging from 1 (“No chance”) to 6 (“Very good chance”), and a separate “I don’t know” category, treated as missing data. The 4 items were analyzed separately.

To measure purchase intentions, participants were asked: “Which of these cola products are you most likely to purchase?” and given the choice of the soda cans shown in condition 1 (with warning label) and condition 2 (no warning label), “neither” and “do not wish to answer.” We treated “do not wish to answer” as missing data.

We also report the sample demographics (ie, age, sex, race, education); body mass index (BMI), calculated on the basis of self-reported height and weight (participants with BMI 25 were classified as “overweight/obese”⁴²); and frequency of drinking SSBs (categorized into 0 SSB drinks per week, 1–3 SSB drinks per week, and 4 or more SSB drinks per week).

Data Analysis

We analyzed data in 2017. To create AOIs, we drew boundary lines around parts of the image using SMI BeGaze 3.5 software. Data from BeGaze were exported for analysis in Stata v.14.2. We calculated mean normalized dwell time and mean normalized number of fixations for participants in each condition (1: warning label; 2: no warning label) by AOI. AOIs included: (1) product name; (2) image of can from the product name to the top; (3) text showing size of can; (4) product descriptor text; and (5) the warning statement (condition 1 only) (Figure 2). We report proportions or mean responses to survey items by condition. We regressed each outcome on label condition, controlling for frequency of drinking SSBs and BMI.

We estimated 3 types of regressions to evaluate the association between measure of visual attention (to warning and non-warning areas of the can) and self-reported outcomes. For recall, we ran logit regressions; analysis of warning statement recall was limited to only those in the warning condition. For product appeal and risk perceptions, we ran linear regressions for all participants. For purchase intentions, we used a multinomial logit model with “neither can” as the base outcome and the 2 types of cans (with and without the warning) as the tested outcomes. All regressions, except those conditional on condition, contain a condition indicator and controlled for BMI.

RESULTS

Participant Characteristics

The sample was mostly female (78.9%), had at least some college education (88.3%), was over-weight or obese (66.5%), and drank SSBs at least weekly (59.5%) (Table 1).

Main Effects of Condition

Visual attention to non-warning AOIs was significantly lower in the “Warning” condition compared to the “No Warning” condition (Table 2). The warning AOI received the most visual attention among all AOIs for participants who were in the “Warning” condition. Heat maps of participants’ visual attention to the SSB images are provided in Figure 2.

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

Participants were less likely to recall seeing “Cold, Crisp, Refreshing” slogan in the “Warning” condition (64.8%) compared to the “No Warning” condition (81.5%, $p < .05$). The differences in recall of the words “Cola” and can size were not statistically significant (Table 3). Among participants in the warning condition, 85.2% accurately recalled the warning label on the SSB image.

Compared to the “No Warning” condition, participants in the “Warning” condition viewed the SSB as less healthy ($M_{\text{warning}} = 1.78$ vs $M_{\text{no warning}} = 2.21$, $B = -0.41$, $p < .01$) and perceived the SSB as more likely to contribute to diabetes ($M_{\text{warning}} = 5.70$ vs $M_{\text{no warning}} = 5.27$, $B = 0.48$, $p < .01$). Other differences on product appeal and risk perceptions were not statistically significant (Table 3).

Purchase intentions did not differ significantly between the conditions. Most participants would purchase the can with no warning (57.5% in the “Warning” condition, 60.9% “No Warning”). About one-third of the participants would not buy either beverage (selected “neither”: 33.3% “Warning,” 31.5% “No Warning”). Only 9.2% in the “Warning” condition and 7.6% in the “No Warning” condition indicated that they would choose a can with the warning (Table 3).

We tested for interaction between the condition and SSB drinking frequency (3 categories). The interactions were not statistically significant for all outcomes ($p > .05$, data not shown).

Associations between Visual Attention and Other Outcomes

We examined how visual attention to warning labels and other marketing elements on the can (normalized fixation count and normalized dwell time) was associated with outcomes. For the visual attention to the warning, greater normalized fixation count (aOR = 1.03, 95% confidence interval [CI] = 1.01, 1.05, $p < .01$) and longer normalized dwell time were positively associated with correct recall of the warning (aOR = 1.07, 95% CI = 1.02, 1.13, $p < .01$), but were not significantly associated with recall of marketing elements. Visual attention to marketing elements was not associated with recall of the warning or marketing elements (Table 4).

Visual attention to the warning was not associated with product appeal. Participants with greater normalized fixation count on the marketing elements rated the product as less attractive ($B = -0.03$, 95% CI = -0.06 , -0.001 , $p < .05$), but visual attention to marketing elements was not associated with other measures of product appeal (Supplementary Table 1).

Visual attention to the warning was not associated with risk perceptions. Attention to marketing elements on the can was negatively related to perceptions of risk: greater normalized fixation count ($B = -0.02$, 95% CI = $-0.04, -0.001$, $p < .05$) and longer normalized dwell time were associated with lower perceived risk of weight gain ($B = -0.05$, 95% CI = $-0.10, -0.01$, $p < .05$) (Supplementary Table 2).

Greater normalized dwell time on the warning label was associated with being more likely to opt out of purchasing any can (picking “neither”) compared to intention to purchase the can with the warning label (RRR = 0.93, 95% CI = $0.88, 0.997$, $p < .05$). Visual attention to marketing elements was not associated with purchase intentions (Supplementary Table 3).

DISCUSSION

To our knowledge, this is the first study to evaluate consumers’ visual attention to warning labels on SSB using an eye tracking approach and how this influences their attention to other product descriptors on the can and perceptions about SSB. Placing a text warning label on a soda can resulted in lower visual attention to other parts of the can, including the brand name and on-pack advertising. Seeing a warning label made participants perceive this product as less healthy and increased perceived risk of diabetes from drinking SSBs, but did not result in different perceptions of product appeal, other risk perceptions, or purchase intentions. Visual attention to the warning was associated with greater recall of the warning, but not product appeal or perceptions of risk. In contrast, visual attention to the marketing elements on the can (eg, brand, slogan) was related to lower perceived risks of weight gain associated with consumption of SSBs.

Several experiments examined effects of SSB warning labels on perceptions and intentions regarding SSBs.^{24–26} Two of these used the same warning label as in our study,^{24,25} comparing it to the no warning label condition. For the measures that were similar across our study and other studies, the findings also are similar: warning labels reduced perception that the SSB was healthy (significantly in our study and Roberto et al’s²⁵), increased perceived risk of SSBs, and did not significantly impact the perceptions of taste. In our study, only perceived risk of diabetes increased significantly, whereas Roberto et al²⁵ found statistically significant differences for perceptions of risk of diabetes, weight gain, and heart disease. However, the absolute differences in perceived risk between conditions with and without the warning label were similar between the studies (difference between the 2 conditions on 1–6 perceived risk scale in our study was 0.2–0.4 and in Roberto et al was 0.1–0.3 on a 1–7 scale). These differences were significant in Roberto et al likely due to the large sample size ($N = 2381$), resulting in greater power.

Visual attention to the warning was associated with better recall of the warning. Recall of the warning is an important first step in evaluating whether a warning is effective^{43,44} and, according to the warning labels impact framework, could subsequently influence cognitive and emotional reactions to the warning, beliefs and attitudes, and ultimately, behavior.¹⁷ Our finding is in line with studies that consistently found that visual attention to the warnings in tobacco advertisements was related to higher recall of the warnings.^{30,44–46}

We did not find an association between measures of visual attention and perceived risks, which is also similar to findings by Kaufman et al who examined how visual attention to various elements on a smokeless tobacco (snus) advertisement, including text warning label, is related to perceived harm and addictiveness of snus.⁴⁷ Although another study found that dwell time on textual information in the pictorial warning predicted smokers' risk perception, visual attention to the pictorial part of the warning was not a statistically significant predictor.⁴⁸ Taken together, these findings indicate that although presence of the warning might increase perceived risk of the product (such as SSBs or tobacco), the amount of visual attention to the warning does not matter much.

Additionally, it is worthwhile to consider various measurements of perceived risk. Our measure focused on personal susceptibility, or beliefs about likelihood of experiencing the negative health outcomes, such as diabetes or weight gain. However, the warning also communicated about severity of the outcomes – how serious these health harms are. Some studies on warning labels have found few effects of warnings on perceived susceptibility.^{17,49} Future studies might consider measuring risk perceptions differently and evaluate the effects of SSB warnings on perceptions of severity of the associated health outcomes.

In a lawsuit that followed the passage of the San Francisco bill mandating textual warning on advertisements for SSBs, the beverage and advertising companies argued that placing a warning on advertisements for SSBs “will divert consumer attention from the balance of an advertisement, undermine consumers' perception of the advertised product, and discourage its consumption.”²³ We found mixed evidence for these claims. Young adults spent less time looking at the advertising-related areas of the can in the presence of a warning label and fewer participants recalled seeing the “Cold, Crisp, and Refreshing” slogan (although in the warning condition almost 65% of participants still correctly recalled that slogan). In contrast, the recall of the “Cola” brand and the size did not differ between the conditions. Although participants who saw the warning perceived this product to be less healthy, the perceptions of attractiveness, price, quality, and taste were unaffected. Intentions to purchase the product also did not differ between the conditions. These findings indicate that even on a non-branded can, presence of a textual warning detracts little in terms of consumer perceptions of the physical characteristics of the product/brand.

It is worth distinguishing between consumer perceptions of risk (which is what the warning labels are trying to change) and perceptions of the quality or other characteristics of the products. We found that whereas perceptions related to health risks of diabetes were higher among participants who saw the warning, the perceptions of attractiveness and other product qualities were not different. This finding can be used in litigation to counteract industry's claims that textual warnings “undermine consumers' perceptions”²³ of SSBs and to argue that these claims inform consumers without damaging the product's image. However, from the public health perspective, the ultimate goal is to discourage consumption. Research in tobacco warning labels demonstrates that warning labels have greater effect on behavior when they reduce positive perceptions of cigarettes because they are graphic and evoke disgust.^{15–17,50} This study provides some of the first empirical data on the visual attention effects of warning labels on SSBs. Although the findings are in line with past research on tobacco warning labels, they are important from the legal and public health perspectives. As

the legal battles to put warnings on the SSBs are just starting, research is needed to develop labels that are effective at changing behavior and discouraging consumers from drinking SSBs.

LIMITATIONS

Use of a convenience sample limits the generalizability of findings; however, eye tracking studies are typically done with convenience samples and the number of participants in our sample was comparable with past eye tracking studies on warning labels that employed between 22 and over 300 participants.³³ Our sample was mostly female (79%) and we only recruited non-Hispanic white and non-Hispanic black participants, which further reduces the generalizability of the results. We focused on a single warning label and a single exposure via computer screen, rather than an actual product. In the real world, people see different labels and their attention to them decreases over time. We also used an unbranded can rather than the image of an actual product in the market. Future eye tracking studies should examine multiple warning labels over several exposures and evaluate the attention to warnings on real products and product advertisements for existing brands.

Conclusions

A textual warning label on a soda can reduced visual attention to marketing elements on the can and increased perceived risk of diabetes linked to SSB consumption. Visual attention to the warning was associated with greater warning recall. These findings complement the results of the experimental studies indicating that warning labels on SSBs might be a viable strategy to inform consumers about risks associated with drinking beverages with added sugars. Furthermore, whereas participants who saw warnings spent less time looking at other areas of the can, this reduced attention did not translate into lower perceptions of quality of the product.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations

AOI	Area of interest
aOR	Adjusted odds ratio
BMI	Body mass index
CI	Confidence interval

FIF	First In Focus Research, Inc.
OR	Odds ratio
RRR	Relative risk ratio
SMI	SensoMotoric Instruments
SSB	Sugar-sweetened beverage

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Figure 1.
Images of Cola Can Used in the Study (a) Without the Warning and (b) with the Warning Label

Figure 2.

Cola Can with (a) No Warning Label, (b) Warning Label, and (c) Areas of Interest (AOI). Note. AOIs are labeled as (1) product name; (2) image of can from the product name to the top; (3) text showing size of can; (4) product descriptor text; and (5) the warning statement (only in the warning label condition). Heat maps for fixation time are shown for the cans without the warning label and with the warning label (a and b). The scale on the bottom indicates average fixation time in milliseconds.

Table 1

Study Sample Characteristics (N = 180)

	Condition		
	No Warning (N = 92) Mean	Warning (N = 88) Mean	Overall (N = 180) Mean
Age			
Years	25.5	25.8	25.6
Sex			
Female	73.9%	84.1%	78.9%
Male	26.1%	15.9%	21.1%
Race			
White	44.6%	51.7%	48.0%
Black	45.7%	43.7%	44.7%
Hispanic	1.1%	0.0%	0.6%
Other	8.7%	4.6%	6.7%
Education			
Less than High School	2.2%	3.4%	2.8%
HS degree	9.8%	8.0%	8.9%
Some college	32.6%	37.9%	35.2%
College degree	55.4%	50.6%	53.1%
Income			
Less than \$25,000	30.0%	24.4%	27.3%
\$25,000-\$49,999	36.7%	32.6%	34.7%
\$50,000-\$74,999	16.7%	23.3%	19.9%
More than \$75,000	16.7%	19.8%	18.2%
BMI			
Under/Normal weight (BMI < 25)	27.2%	40.2%	33.5%
Overweight/Obese (BMI ≥ 25)	72.8%	59.8%	66.5%
SSB Usage			
0 SSB drinks per week	37.0%	44.3%	40.6%
1–3 SSB drinks per week	34.8%	30.7%	32.8%
4+ SSB drinks per week	28.3%	25.0%	26.7%

There were no significant differences between conditions on participant characteristics.

BMI: Body Mass Index

SSB: sugar-sweetened beverages

Note.

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Table 2

Visual Attention to SSB Image

	Size (pixels)	(% area)	Fixation Count (#)			Dwell Time (seconds)		
			Warning (N = 88)	No Warning (N = 88)	No Warning (N = 92)	Warning (N = 88)	No Warning (N = 88)	No Warning (N = 92)
Total Can	165,349	100.0	25.50	24.45		8.59		8.61
Non-Warning AOIs								
Name	78,586	47.5	18.60**	30.81**		6.16**		10.84**
Top	15,995	9.7	31.83**	49.67**		10.11**		17.19**
Size	52,101	31.5	8.33**	16.21**		2.29**		5.11**
Description	6,081	3.7	54.07**	78.32**		21.44**		33.04**
	4,409	2.7	43.04**	69.30**		16.40*		24.92*
Warning AOIs								
Warning	21,496	13.0	81.82	-		27.05		-

*
p < .05

**
p < .01

Note.

Fixation counts and dwell times are reported as normalized to the AOI size.

Table 3
Self-reported Survey Outcomes: Recall, Product Appeal, Risk Perceptions, and Purchase Intentions by Condition

	Condition		B	RRR	aOR	p
	No Warning (N = 92) % or Mean	Warning (N = 88) % or Mean				
Correct recall						
Warning	-	85.2%	-	-	-	-
“Clean, crisp, refreshing”	81.5%*	64.8%*	73.3%		0.36	.006
“Cola”	95.7%	93.2%	94.4%		0.73	.65
Size	84.8%	75.0%	80.0%		0.57	.16
Product Appeal [1–7] ^d						
Cheap – Expensive	1.90	1.99	1.94	0.08		.69
Unattractive - Attractive	3.45	2.97	3.21	−0.43		.10
Low - High Quality	2.36	2.40	2.38	0.04		.84
Uncool - Cool	3.63	3.33	3.48	−0.24		.31
Unhealthy - Healthy	2.21**	1.78**	2.00	−0.41		.009
Tasted Bad - Good	4.53	4.40	4.46	−0.06		.83
Product Appeal Scale	3.01	2.80	2.91	−0.18		.26
Risk Perceptions [1–6]						
Weight gain	5.56	5.72	5.64	0.21		.17
Heart disease	4.73	4.99	4.86	0.26		.23
Diabetes	5.27**	5.70**	5.48	0.48		.002
Tooth decay	5.46	5.58	5.52	0.16		.32
Risk Perceptions Scale	5.29	5.50	5.39	0.25		.07
Purchase Intentions						
Can w/ No Warning	60.9%	57.5%	59.2%		.97	.94
Can w/ Warning	7.6%	9.2%	8.4%		1.31	.66
Neither Can	31.5%	33.3%	32.4%		<i>b</i>	-

Note.

^a : For product appeal, higher number indicates more positive view of the product (eg, expensive, attractive, healthy).

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β ; Purchasing neither can is the base outcome in a multinomial logistic regression. Purchasing a can with no warning or a can with a warning are the other outcome categories. The RRRs represent the odds of purchasing a can without or with a warning relative to purchasing neither can for those in the warning condition compared to the no warning condition.

B: unstandardized regression coefficient

RRR: relative risk ratio

p: p-value

Raw statistics are displayed. Statistical significance estimated using regressions of each outcome on label condition, controlling for frequency of drinking SSBs and BMI.

Boldface indicates statistical significance (*p < .05, ** p < .01).

Table 4

Association between Visual Attention and Correct Recall of Information

Recall of	Warning		“Clean, crisp, refreshing”		“Cola”		Size	
	aOR (95% CI)	p	aOR (95% CI)	p	aOR (95% CI)	p	aOR (95% CI)	p
Visual attention to the warning label (AOI 5) (N = 87)								
Normalized Fixation Count	1.03 (1.01–1.05)	.004	0.99 (0.98–1.01)	.33	1.00 (0.97–1.02)	.73	1.00 (0.98–1.01)	.75
Normalized Dwell Time	1.07 (1.02–1.13)	.008	1.01 (0.97–1.04)	.72	0.97 (0.89–1.05)	.46	1.00 (0.96–1.04)	.96
Visual attention to the marketing elements on the can excluding the warnings (AOIs 1, 2, 3, and 4) (N = 179)								
Normalized Fixation Count	1.06 (0.97–1.15)	.18	1.03 (0.99–1.08)	.11	1.06 (0.98–1.16)	.16	1.02 (0.98–1.07)	.37
Normalized Dwell Time	1.02 (0.82–1.26)	.86	1.10 (0.99–1.23)	.07	1.12 (0.90–1.39)	.30	1.07 (0.96–1.21)	.22

Note.

Results estimated using logistic regression, controlling for BMI. Regressions conditional on being in the warning condition.

aOR: adjusted Odds Ratio

AOI: area of interest

p: p-value