The role of alcohol packaging as a health communications tool: An online cross-sectional survey and experiment with young adult drinkers in the United Kingdom

DANIEL JONES[1] , CRAWFORD MOODIE[1] , RICHARD I. PURVES[1] ,
NIAMH FITZGERALD[1,2] & RACHEL CROCKETT[3]

[1]*Institute for Social Marketing and Health, Faculty of Health Sciences and Sport, University of Stirling, Stirling, UK,*
[2]*SPECTRUM Consortium, Edinburgh, UK, and* [3]*Psychology Department, Faculty of Natural Sciences, University of Stirling, Stirling, UK*

Abstract

Introduction. *Alcohol packaging is a potentially valuable means of communicating product and health-related information, with growing academic and political interest in its role as a health communications vehicle.* ***Methods.*** *An online cross-sectional survey and experiment were conducted with a non-probability sample of 18–35-year-old drinkers in the United Kingdom (n = 1360). The survey assessed exposure to, and engagement with, current messaging on packs, and support for displaying product and health-related information. For the randomised experiment, participants were shown, and asked questions about, a vodka bottle with either no warnings (control), small text warnings, large text warnings or pictorial (image-and-text) warnings; the main binary outcome measures were negative product appeal and social acceptability, and positive cognitive and behavioural impact.* ***Results.*** *Two-fifths of the sample rarely or never saw on-pack health-related information, with almost three-quarters rarely or never reading or looking closely at this. There was strong support for displaying a range of product and health-related information (e.g. units, ingredients) on packs. Relative to the control, products with warnings were more likely to be perceived as unappealing and socially unacceptable, and to positively impact alcohol-related cognitions and behaviours. For example, pictorial warnings were 10 times as likely to positively influence cognitions and behaviours (AOR = 10.01, 95% CI: 8.09, 17.46).* ***Discussion and Conclusions.*** *Alcohol packaging could have an important role in delivering health messaging. Large pictorial or text warnings may help counteract the appeal and social acceptability of alcohol products and increase awareness of risks, potentially supporting a reduction in consumption and related harms.* [Jones D, Moodie C, Purves RI, Fitzgerald N, Crockett R. The role of alcohol packaging as a health communications tool: An online cross-sectional survey and experiment with young adult drinkers in the United Kingdom. *Drug Alcohol Rev* 2022]

Key words: alcohol packaging, alcohol warnings, alcohol labelling, young adult drinkers, quantitative.

Introduction

Alcohol packaging can be used to communicate the harms associated with consumption. There is clearly a need to do so given that alcohol misuse is a key risk factor for illness, disability and death, implicated in more than 200 diseases and responsible for approximately 3.3 million deaths annually [1]. Although academic interest in warnings on alcohol packaging is in its infancy when compared to tobacco, evidence suggests that well-designed warnings on alcohol products can capture attention, inform consumers of possible risks, increase awareness and knowledge of harms, decrease speed of drinking and support a reduction in consumption, with moderate consumer support for warnings [2–7]. Research in the United Kingdom (UK) with young adult drinkers, for instance, found that large, pictorial (image-and-text), front-of-pack warnings with specific health conditions could help reduce individual and social appeal of alcohol products [8].

In the UK, alcohol harm is an important public health issue, with 8974 alcohol-specific deaths in 2020 [9,10]. The appearance of alcohol packs in the UK does not reflect this risk, with the inclusion of warnings voluntary; where used, these are typically restricted to

small symbols warning not to drink if pregnant or driving [11]. A review of 424 alcohol packs randomly selected in UK shops found that only one (0.24%) included a factual health statement ('Alcohol consumption is injurious to health') on the back label, while 423 (99.76%) packs either had no statement or only a responsibility statement (e.g. 'drink responsibly') [12]. The only product and health-related information legally required on alcohol packaging in the UK is volume, strength/alcohol by volume (ABV) and presence of common allergens [13], which is not considered to meaningfully inform consumers let alone influence drinking behaviours [8,12]. Research suggests that consumers in the UK are not engaging with the information currently provided on alcohol packaging and generally support the inclusion of product and health-related information (e.g. number of alcohol units, calories) [8,14,15].

Academic and political interest in alcohol packaging in the UK is growing [13], as it is elsewhere [7,16,17]. This study aimed to assess a sample of young adult drinkers' (i) exposure to, and engagement with, current messaging on packs; (ii) support for displaying product and health-related information; and (iii) reactions to randomly-allocated front-of-pack warnings in terms of product appeal, social acceptability and cognitive and behavioural impact. Based on previous alcohol and tobacco research [18,19], we hypothesised that more salient warnings (i.e. large text, pictorial) would be more effective than small-text warnings and the absence of warnings in reducing product appeal and social acceptability, and positively impacting alcohol-related cognitions and behaviours.

Methods

Design and sample

An online cross-sectional survey was conducted in September–October 2020 with a non-probability sample ($n = 1360$) of 18–35-year-old current drinkers residing in the UK. To explore the impact of the presence and type of warning on product appeal, social acceptability, and cognitive and behavioural impact (aim 3), we incorporated a between-groups experiment into the survey. Surveys and experiments are regularly used in alcohol packaging studies [2,14,19–21], with young adults frequently targeted by alcohol producers when (re)designing packaging [22] and a key population for public health given high levels of hazardous drinking [23].

Recruitment

River sampling is common in non-probability online surveys [24]. Participants were recruited via targeted Facebook adverts, a means of accessing specific demographic profiles across a wide geographic area [25], as with previous research involving young adult drinkers [26]. The adverts stated that a University of Stirling study about alcohol use and packaging was recruiting 18–35-year-olds living in the UK who drink alcohol (i.e. eligibility criteria), with the chance to win one of 10 £50 Love2shop e-gift cards. Potential participants were invited to complete the survey, which was hosted by Jisc and accessible on any device with an internet connection, via a link in the adverts.

Procedure

Those clicking on the link were informed about the study aims, content, duration (10 min), data privacy and that participation was voluntary and that they could exit the survey at any time, before being asked to provide consent. Participants indicated their country of residence and age, with those living outside the UK or not aged 18–35 screened out. To be considered a current drinker and therefore eligible to participate, participants had to answer anything other than 'Never' to the screening question '*How often do you have a drink containing alcohol?*', the first item of the Alcohol Use Disorders Identification Test for Consumption (AUDIT-C) [14]. Participants were asked about sociodemographics and drinking behaviours, exposure to, and engagement with, current messaging on packs, support for displaying product and health-related information and response to novel warnings. Most items were compulsory but included 'Neither agree nor disagree' or 'Don't know/Prefer not to say' options where applicable.

For the between-groups experiment assessing the impact of warning design, participants selected one of four words ('Cord', 'Lock', 'Plug', 'Shed') and, similar to a previous online experiment [20], were randomly allocated to one of four conditions (Figure 1): control (no warnings, $n = 383$), small-text warnings ($n = 307$), large-text warnings ($n = 350$) or pictorial warnings ($n = 320$). Participants were unaware of the purpose of the word selection and were informed that it did not matter which random word they chose as there was no right or wrong answer, thus, eliminating bias in treatment assignments [27].

All participants were able to enter a prize draw at the end of the survey for their time and provided contact details for alcohol support. Ethical approval was granted by the General University Ethics Panel

Figure 1. *Alcohol packaging displaying no warning (control) and warnings differing by text-size (small; large), form (text-only; pictorial) and image content.*

(GUEP 945) at the University of Stirling. The survey protocol was not pre-registered.

Materials

Each warning set included one general ('Alcohol damages your health') and two specific ('Alcohol causes liver disease', 'Alcohol causes mouth cancer') warnings. The specific warnings were selected as more than three-quarters of alcohol-specific deaths in the UK in 2020 were caused by alcoholic liver disease [9] and past research suggests that it is more effective to specify the type of cancer [8], with alcohol-related mouth cancer prevalent in the UK [28]. For those in the pictorial warning condition, an appropriate image was chosen to reflect each warning: 'Alcohol damages your health' (image of blood pressure test); 'Alcohol causes liver disease' (image of person clutching their liver); 'Alcohol causes mouth cancer' (image of CT scanner in a hospital). For consistency, in each condition participants were shown an image of a bottle of Smirnoff Red Label No. 21 vodka. Smirnoff was chosen because it was the most popular alcohol brand in the UK and the highest-selling vodka, with positivity ratings similar among males and females and highest among millennials, who comprised most of the sample [29,30].

Measures

Exposure to, and engagement with, current messaging and support for displaying product and health-related information. To address aim 1, participants were asked how often they see, and read or look closely at, the health-related information, messages or warnings on alcohol packaging [8,14], with responses coded as 'Sometimes', 'Often' or 'Always' versus 'Rarely' or 'Never'. To address aim 2, we explored whether participants supported displaying the following information on alcohol packaging: strength/ABV; number of units; ingredients; number of servings equal to recommended weekly guidelines; weekly unit guidelines for men and women; calories; health conditions which can result from drinking alcohol; health warnings on the front of packs [31]. Responses were 'Strongly Disagree' (1) to 'Strongly Agree' (5).

Response to packaging with/without warnings. For aim 3, participants were shown images of a Smirnoff bottle with warnings (experimental conditions) or without warnings (control condition) and asked a series of questions (Table S1) informed by previous research [8,20,32], e.g. '*These alcohol products would make me aware of the health risks of drinking*'. For each question, responses were 'Strongly Disagree' (1) to 'Strongly Agree' (5). The responses to the item '*I find these alcohol products off-putting*' were reverse-coded.

Sample characteristics. Information on country of residence, age, gender, ethnicity, religiosity, occupation, education and social grade was captured; social grade was categorised according to the occupation of the person in the household with the greatest income [33], with grades A, B and C1 indicating higher and middle-class groups and C2, D and E working-class groups.

Alcohol consumption. The three-item AUDIT-C scale was used to measure consumption [14]: (i) frequency of consumption (0 = 'Never' to 4 = 'Four or more

times a week'); (ii) number of units drunk in a typical drinking occasion (0 = 'One or two' to 4 = 'Ten or more'); and (iii) how often they drunk six or more units if female, or eight or more if male, on a single occasion in the last year (0 = 'Never' to 4 = 'Daily or almost daily').

Awareness and perceptions of Smirnoff vodka.   Participants were asked about awareness of the Smirnoff vodka brand and how they rated it on a scale from 1 = 'Very Unappealing' to 5 = 'Very Appealing'. Participants were asked these questions as a Smirnoff bottle was used to display the novel warnings.

Analysis

Data were analysed using SPSS (Version 28). Analyses were unweighted and were not pre-registered. A total of 3987 people clicked on the survey link, with 1511 completing it and the remainder screened out or choosing to exit. To ensure meaningful engagement with the survey content, we excluded participants in the bottom five percentile (range: 04:01 to 05:53, $n = 76$) and top five percentile of completion time (range: 24:05 to 10:02:14, $n = 75$). Identifying implausible response times is a common means of removing careless respondents and improving data quality in alcohol research [34], with a median completion time of 09:07 for the final sample ($n = 1360$). Frequencies examined exposure to, and engagement with, current messaging (aim 1), see Table 2, and support for displaying product and health-related information (aim 2), see Table 3.

Principal components analysis using varimax rotation was conducted to determine the factorability of warning response items (Table S1), with two components extracted, defined and used as composites: 'appeal and social acceptability' and 'cognitive and behavioural impact'. Binary outcomes are commonly measured in global health research [35], and have been used in alcohol and tobacco packaging studies [21,36]. Comparable to previous tobacco research [37], composite scores were recoded into binary variables based on the mid-point of possible scores to mutually exclude, and enable comparison of, positive and negative reactions to the stimuli. The main outcome measures were product appeal and social acceptability scores (mid-point = 21), coded as negative (≤ 20, $n = 611$) or neutral/positive (≥ 21, $n = 749$) (Table S2), and cognitive and behavioural impact scores (mid-point = 15), coded as positive (≥ 16, $n = 612$) or neutral/negative (≤ 15, $n = 748$) (Table S3).

For aim 3, hierarchical binary logistic regression models with simple contrasts examined the main effect of warning condition on negative product appeal and social acceptability (Table 4), and positive cognitive and behavioural impact (Table 5), respectively. In both models, block one controlled for sociodemographic and drinking-related factors identified in past research as influencing responses to warnings [21,38–41]: age, gender, social grade, higher education qualifications or professional/vocational equivalents, occupational status, AUDIT-C category and Smirnoff appeal, with warning condition entered in block two. The control condition was chosen as the reference category to

Table 1. *Sample characteristics*

Variable	Frequency	
	n	%
Country of residence		
England	948	69.7
Scotland	292	21.5
Wales	81	6.0
Northern Ireland	39	2.9
Ethnicity		
White British	1196	87.9
Other	164	12.1
Gender		
Male	519	38.2
Female	811	59.6
Non-binary	22	1.6
Prefer not to say	8	0.6
Social grade		
C2DE	352	25.9
ABC1	841	61.8
Prefer not to say/Do not know	167	12.3
Higher education/equivalents[a]		
No	686	50.4
Yes	664	48.8
Prefer not say/Do not know	10	0.7
Occupation		
In employment or education	1197	88.0
Not in employment or education	138	10.1
Prefer not to say	25	1.8
Religious affiliation		
No	975	71.7
Yes	332	24.4
Prefer not to say	53	3.9
Alcohol consumption[b]		
Higher-risk drinker	1098	80.7
Lower-risk drinker	230	16.9
Not computable	32	2.4

Sample ($n = 1360$) characteristics are unweighted. [a]Reflects whether participants had higher education qualifications or professional/vocational equivalents. [b]As the third AUDIT-C item measures binge drinking by gender ('How often have you had 6 or more units if female, or 8 or more if male, on a single occasion in the last year?'), cumulative AUDIT-C scores were not computable for those who did not indicate their gender as either male or female ($n = 30$), with two participants preferring not to answer the third item. AUDIT-C, Alcohol Use Disorders Identification Test for Consumption.

determine the effect of including warnings on packaging, with subsequent analyses using the large-text condition as the reference category to assess the relative effect of warning design.

Results

Sample characteristics

Most participants were White British (87.9%), female (59.6%), resided in England (69.7%) and in social grades A, B and C1 (61.8%) (Table 1). Most of them were in employment or education (88.0%), non-religious (71.7), with approximately half having higher education qualifications or professional/vocational equivalents (48.8%). The mean age was 26.04 years ($SD = 5.25$).

Table 2. *Exposure to, and engagement with, health-related information, messages or warnings on alcohol packaging*

Frequency	Exposure[a]		Engagement[b]	
	n	%	n	%
Always	214	15.7	30	2.2
Often	272	20.0	84	6.2
Sometimes	328	24.1	295	21.7
Rarely	404	29.7	536	39.4
Never	142	10.4	415	30.5
Total	1360	100	1360	100

[a]To measure frequency of exposure, participants were asked '*How often do you see health-related information, messages or warnings on alcohol packaging?*'. [b]To measure frequency of engagement, participants were asked '*How often do you read or look closely at the health-related information, messages or warnings on alcohol packaging?*'.

Alcohol consumption

As never-drinkers were ineligible, cumulative AUDIT-C scores ranged from 1 to 12 ($M = 7.06$, $SD = 2.58$, $n = 1328$), with acceptable internal consistency ($\alpha = 0.71$). Cumulative scores ≥5 indicate higher-risk consumption [14,42], with four-fifths (80.7%) of participants reporting higher-risk consumption (Table 1).

Awareness and perceptions of Smirnoff vodka

Participants were aware of Smirnoff ($n = 1358$, 99.9%) and rated it somewhat positively ($M = 3.25$, $SD = 1.05$).

Exposure to, and engagement with, current messaging and support for displaying product and health-related information

While most participants (59.9%) reported seeing health-related information, messages or warnings on alcohol packaging sometimes, often or always, two-fifths (40.1%) rarely or never do, with most (69.9%) rarely or never reading or looking closely at it (Table 2). Participants largely supported displaying a range of product and health-related information on packaging (Table 3). For example, 94.7% agreed or strongly agreed that units should be displayed on packaging, with 88.8%% agreeing or strongly agreeing that ingredients should be included.

Predictors of negative appeal and social acceptability, and positive cognitive and behavioural impacts

Both hierarchical logistic regression models were statistically significant compared to respective null

Table 3. *Support for displaying product and health-related information on alcohol packaging*

Variable	Strongly agree		Agree		Neither agree nor disagree		Disagree		Strongly disagree	
	n	%	n	%	n	%	n	%	n	%
Strength (ABV)	1061	78.0	272	20.0	23	1.7	2	0.1	2	0.1
Units	957	70.4	331	24.3	53	3.9	16	1.2	3	0.2
Ingredients	719	52.9	488	35.9	111	8.2	34	2.5	8	0.6
Guidelines (servings)[a]	557	41.0	468	34.4	209	15.4	91	6.7	35	2.6
Guidelines (gender)[b]	468	34.4	508	37.4	275	20.2	82	6.0	27	2.0
Calories	499	36.7	461	33.9	275	20.2	90	6.6	35	2.6
Health conditions[c]	347	25.5	428	31.5	336	24.7	186	13.7	63	4.6
Health warnings[d]	294	21.6	330	24.3	303	22.3	259	19.0	174	12.8

Total $n = 1360$. [a]How many servings of the product are equal to the recommended weekly guidelines. [b]Guidelines on how many units men and women should drink each week. [c]Information on health conditions which can result from drinking alcohol. [d]Health warnings on the front of alcohol packaging. ABV, alcohol by volume.

Table 4. *Logistic regression exploring association between warning condition and negative appeal and social acceptability*

Variables and reference (REF) categories	n	AOR	95% CI	P-value
Block 1				
Age	1318	0.99	0.96, 1.01	0.327
Gender				
Male	513	REF		
Female	805	1.82	1.41, 2.35	<0.001**
Social grade				
C2DE	343	REF		
ABC1	821	1.46	1.09, 1.95	0.011*
Prefer not to say/Don't know	154	1.23	0.80, 1.90	0.347
Higher education/equivalents[a]				
No	670	REF		
Yes	648	1.8	1.40, 2.31	<0.001**
Occupation				
In employment or education	1167	REF		
Not in employment or education	130	0.69	0.46, 1.05	0.084
Prefer not to say	21	0.92	0.34, 2.47	0.865
Alcohol consumption				
Higher-risk drinker	1089	REF		
Lower-risk drinker	229	1.61	1.17, 2.21	0.003**
Smirnoff vodka brand appeal	1318	0.65	0.57, 0.73	<0.001**
Block 2				
Warning condition				
Control	371	REF		
Small text (vs. Control)	300	2.88	2.03, 4.09	<0.001**
Large text (vs. Control)	341	5.01	3.56, 7.05	<0.001**
Pictorial (vs. Control)	306	4.74	3.34, 6.72	<0.001**

Dependent variable, appeal and social acceptability: 1 = Negative ($n = 586$); 0 = Neutral/Positive ($n = 732$). Independent variable categories were compared to reference (REF) categories using simple contrasts. Cases analysed ($n = 1318$). Cases excluded due to missing data or insufficient number of observations ($n = 42$). Model summaries for final block: Test of model coefficients: $\chi^2(12) = 235.22$, $P < 0.001$. Hosmer–Lemeshow: $\chi^2(8) = 13.00$, $P = 0.112$. Nagelkerke R^2: 0.22. Cases correctly classified: 67.6%. [a]Reflects whether participants had higher education qualifications or professional/vocational equivalents. *Adjusted odds ratio (AOR) is statistically significant at the 0.05 level. **AOR is statistically significant at the 0.01 level. CI, confidence interval.

models, with acceptable goodness-of-fit as per Hosmer–Lemeshow tests (Tables 4 and 5) and multicollinearity not present (variance inflation factors ≈ 1). After controlling for covariates, participants who viewed products with warnings were significantly more likely to perceive the products as unappealing and socially unacceptable than the control condition (Table 4): small-text warnings, adjusted odds ratio (AOR) = 2.88, $P < 0.001$, 95% confidence interval (CI) [2.03, 4.09]; large-text warnings, AOR = 5.01, $P < 0.001$, 95% CI [3.56, 7.05]; pictorial warnings, AOR = 4.74, $P < 0.001$, 95% CI [3.34, 6.72]. Relative to the large-text condition, participants who viewed small-text warnings were significantly less likely to perceive the products as unappealing and socially unacceptable, AOR = 0.58, $P = 0.001$, 95% CI [0.41, 0.80], with no difference in the pictorial condition, AOR = 0.95, $P = 0.743$, 95% CI [0.68, 1.32]. Of the other covariates, being female ($P < 0.001$), a lower-risk drinker ($P = 0.003$), in social grade ABC1 ($P = 0.011$), and having higher education qualifications or professional vocational equivalents ($P < 0.001$) and a lower Smirnoff rating ($P < 0.001$) were associated with negative appeal and social acceptability in the final model.

After controlling for covariates, participants who viewed products with warnings were significantly more likely to report positive cognitive and behavioural impacts than the control condition (Table 5): small-text warnings, AOR = 8.87, $P < 0.001$, 95% CI [6.00, 13.10]; large-text warnings, AOR = 11.88, $P < 0.001$, 95% CI [8.09, 17.46]; pictorial warnings, AOR = 10.01, $P < 0.001$, 95% CI [6.78, 14.77]. Relative to the large-text condition, the likelihood of positive cognitive and behavioural impacts was not significantly different in the small-text condition, AOR = 0.75, $P = 0.075$, 95% CI [0.54, 1.03], or pictorial condition, AOR = 0.84 $P = 0.296$, 95% CI [0.61, 1.16]. Of the other covariates, only being female ($P = 0.003$) and a lower-risk drinker ($P < 0.001$) were associated with positive cognitive and behavioural impact in the final model.

Table 5. *Logistic regression exploring association between warning condition and positive cognitive and behavioural impact*

Variables and reference (REF) categories	*n*	*AOR*	95% CI	*P*-value
Block 1				
Age	1318	0.98	0.96, 1.01	0.122
Gender				
Male	513	REF		
Female	805	1.48	1.14, 1.91	0.003**
Social grade				
C2DE	343	REF		
ABC1	821	0.78	0.58, 1.04	0.087
Prefer not to say/Don't know	154	0.83	0.54, 1.29	0.416
Higher education/equivalents[a]				
No	670	REF		
Yes	648	1	0.78, 1.29	0.988
Occupation				
In employment or education	1167	REF		
Not in employment or education	130	1.02	0.68, 1.54	0.925
Prefer not to say	21	1.3	0.46, 3.72	0.623
Alcohol consumption				
Higher-risk drinker	1089	REF		
Lower-risk drinker	229	2.19	1.57, 3.06	<0.001**
Smirnoff vodka brand appeal	1318	1.08	0.96, 1.22	0.21
Block 2				
Warning condition				
Control	371	REF		
Small text (vs. Control)	300	8.87	6.00, 13.10	<0.001**
Large text (vs. Control)	341	11.88	8.09, 17.46	<0.001**
Pictorial (vs. Control)	306	10.01	6.78, 14.77	<0.001**

Dependent variable, cognitive and behavioural impact: 1 = Positive ($n = 593$); 0 = Neutral/Negative ($n = 725$). Independent variable categories were compared to reference (REF) categories using simple contrasts. Cases analysed ($n = 1318$). Cases excluded due to missing data or insufficient number of observations ($n = 42$). Model summaries for final block: Test of model coefficients: $\chi^2(12) = 284.66$, $P < 0.001$. Hosmer–Lemeshow: $\chi^2(8) = 7.55$, $P = 0.479$. Nagelkerke R^2: 0.26. Cases correctly classified: 67.9%. [a]Reflects whether participants had higher education qualifications or professional/vocational equivalents. **Adjusted odds ratio (AOR) is statistically significant at the 0.01 level. CI, confidence interval.

Discussion

This sample of young adult drinkers were influenced by warnings on alcohol packaging. We found that including a front-of-pack health warning (small-text, large-text or pictorial) on a market-leading brand of vodka reduced product appeal and social acceptability, and could positively influence alcohol-related cognitions and behaviours. As expected, participants who viewed the product with no warnings had the highest social appeal and acceptability ratings, and the lowest reported impact on cognition and behaviour. That those in the control condition were not informed about alcohol-related harms via the packaging is reflective of products on the market, but needs to be considered when interpreting the findings.

Larger warnings (with or without an image) were particularly effective in reducing product appeal and social acceptability, with previous research indicating that prominent warnings on alcohol packaging may help capture attention, counteract positive product perceptions, and reduce consumption intentions [19,43,44].

Surprisingly, we did not find clear differences between warning designs in terms of positively impacting cognitions and behaviours. This is in contrast to the considerable evidence in the tobacco packaging field, where larger warnings with images are more capable of positively influencing smoking-related thoughts and behaviours than smaller, text-only warnings [18,45]. Further research is needed to determine optimal alcohol warning designs. For instance, one study suggests that pictorial warnings may communicate messages more effectively than having just text as it requires less cognitive effort from consumers [8], while others report inconclusive differences in effectiveness (e.g. reducing speed of consumption, increasing risk perception) between pictorial and text-only conditions [6,46,47].

Two-fifths of participants reported rarely or never seeing health-related information, messages or warnings on alcohol packaging, with almost three-quarters, rarely or never reading or looking closely at it. As most of the sample were classified as higher-risk drinkers, it is reasonable to assume they are exposed to alcohol

packaging when drinking at home or in licensed premises, yet most did not interact with the information currently provided. This is unsurprising considering alcohol packaging in the UK is not designed to meaningfully engage or inform consumers, with ambiguous messaging in small fonts usually positioned on the back of packs and over 70% of labels not including up-to-date low-risk drinking guidelines [8,11,12]. Salient warnings with specific health-related messages, as used in our study, can positively influence consumer attention, comprehension, recall, judgement and behavioural compliance [3]. The lack of exposure to warnings on alcohol packaging may help to explain why we failed to find significant differences between pictorial and text warnings in terms of perceived cognitive and behavioural response, in direct contrast to the vast majority of studies in the tobacco field [45]. Warnings have been displayed on cigarette packs for several decades in many countries, so even prior to the inclusion of pictorial images on packs from this century (they were first required in Canada in 2000) people would have been exposed to, and familiar with, warnings on packs. For alcohol, the lack of exposure to any meaningful warning messages on packs may have meant that the novelty of seeing these, irrespective of warning size and type, was sufficient to influence their perceptions. Qualitative research exploring possible reasons for these findings would be of value.

There was strong support for displaying strength/ABV, number of units, ingredients, weekly guidelines (by serving and gender) and calories on alcohol packaging, with moderate support for displaying warnings, consistent with international findings [7,48,49]. Limited consumer engagement with current provisions and support for more information on packaging may be partially explained by legal requirements. While alcohol packaging requirements vary globally [50], minimal information is legally required in the UK (volume, strength/ABV, presence of common allergens) [13], with other product and health-related information (e.g. ingredients, calories, warnings) self-regulated by alcohol companies. Tinawi *et al.* [51] argue that voluntary warnings on alcohol packaging in New Zealand, like the UK, are inadequately designed to inform consumers and that evidence-based, standardised requirements outlining alcohol-related risks are necessary. As over 740 000 of all new cancer cases in 2020 globally were attributable to alcohol consumption [52], with alcoholic liver deaths in the UK increasing [53], our findings could help inform packaging regulations to meaningfully inform consumers about alcoholic products and potential harms.

This study has several limitations to consider. While the warnings used aligned with World Health Organization [54] recommendations (e.g. evidence-based content, different messages in bold and using capital letters, placed in a standard location with clear separation of text from other information, and inclusion of images), this study is unable to provide insight into optimal message content (e.g. specific vs. general text, message framing, image criteria) and real-world reactions to, or longer-term impacts of, warnings on alcohol packaging. The images used were not pre-tested, it should be noted, as would be the case if pictorial warnings were required on packs, and as such the images may not have resonated with or been clear to participants. The images were also somewhat benign, with some arguing that the goal of deterring images is simply to inform consumers and questioning the need to evoke fear or an elevated perception of risk to prevent people from drinking [47]; nonetheless, more severe images (e.g. diseased organs) could elicit stronger responses from drinkers, with alcohol and tobacco research suggesting that severe images are more likely to elicit negative emotional reactions and avoidance behaviour, reduce product appeal, and increase thinking about harms and motivation to drink less [55–58].

Non-probability online surveys are cost-effective and efficient yet lack representativeness and generalisability, partially due to topical self-selection bias and potential differences between those who choose to participate and those who do not [24,59,60]. It has been argued that river samples, like ours, are not formally generalisable beyond the population of users accessing the service (e.g. Facebook) within the sampling period [24]. While careless responding is no more prevalent in alcohol research than other fields [34], we excluded participants with implausible completion times to improve data quality; including an attention check (e.g. careful-read item) could have helped to identify additional careless respondents, potentially further increasing data quality and motivating participants to exert more cognitive effort when answering survey items [61].

Although controlling for Smirnoff vodka brand appeal helped overcome the limitation of showing one product, which ensured brand awareness, consistency and removed potential bias or confounding effects from exposure to multiple products [37], a broader range of alcoholic drinks, brands and pack formats would better represent the choices and preferences consumers have, which may elicit different reactions. This study had a small budget and while this enabled a modest sample size and we achieved relatively good spread across the warning conditions, our sample was not sufficiently large to allow for either more warnings or warnings on a variety of alcohol products. As over 80% of the sample were classified as higher-risk drinkers, future research with other populations that may benefit from exposure to warnings, such as non-drinkers, susceptible drinkers, adolescents and older adult drinkers, is needed.

This sample of young adult drinkers reported limited engagement with the health information, messages and warnings on current alcohol packaging and largely supported the inclusion of product and health-related information. Prominent warnings may help to counteract the appeal and social acceptability of alcohol products, encourage consumers to think about their drinking and, potentially, support a reduction in alcohol consumption and related harms.

Acknowledgements

Conflict of Interest

The authors have no conflicts of interest.

References

[1] World Health Organisation. Noncommunicable diseases: harmful use of alcohol [Internet]. WHO Regional Office for the Eastern Mediterranean. 2021. Available at: http://www.emro.who.int/noncommunicable-diseases/causes/harmful-use-of-alcohol.html (accessed July 2021).

[2] Clarke N, Blackwell AKM, De-Loyde K et al. Health warning labels and alcohol selection: a randomised controlled experiment in a naturalistic shopping laboratory. Addiction 2021;116:3333–45.

[3] Dimova ED, Mitchell D. Rapid literature review on the impact of health messaging and product information on alcohol labelling. Drugs Educ Prev Policy 2021 [Epub ahead of print]. doi: https://doi.org/10.1080/09687637.2021.1932754

[4] Jane-Llopis E, Kokole D, Neufeld M, Hasan OSM, Rehm J. What is the current alcohol labelling practice in the WHO European region and what are barriers and facilitators to development and implementation of alcohol labelling policy? [Internet] Copenhagen; 2020. Available at: https://www.euro.who.int/en/publications/abstracts/what-is-the-current-alcohol-labelling-practice-in-the-who-european-region-and-what-are-barriers-and-facilitators-to-development-and-implementation-of-alcohol-labelling-policy-2020

[5] Neufeld M, Ferreira-Borges C, Rehm J. Implementing health warnings on alcoholic beverages: on the leading role of countries of the commonwealth of independent states. Int J Environ Res Public Health 2020;17:8205.

[6] Stafford LD, Salmon J. Alcohol health warnings can influence the speed of consumption. J Public Heal 2017;25:147–54.

[7] Vallance K, Stockwell T, Zhao J et al. Baseline assessment of alcohol-related knowledge of and support for alcohol warning labels among alcohol consumers in northern Canada and associations with key sociodemographic characteristics. J Stud Alcohol Drugs 2020;81:238–48.

[8] Jones D, Moodie C, Purves RI, Fitzgerald N, Crockett R. Health information, messaging and warnings on alcohol packaging: a focus group study with young adult drinkers in Scotland. Addict Res Theory 2021;29:469–78.

[9] Office for National Statistics. Alcohol-specific deaths in the UK: registered in 2020 [Internet]. Office for National Stat 2021. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/causesofdeath/bulletins/alcoholrelateddeathsintheunitedkingdom/registeredin2020

[10] Thompson A, Pirmohamed M. Associations between occupation and heavy alcohol consumption in UK adults aged 40–69 years: a cross-sectional study using the UK biobank. BMC Public Health 2021;21:190.

[11] Petticrew M, Douglas N, Knai C, Durand MA, Eastmure E, Mays N. Health information on alcoholic beverage containers: has the alcohol industry's pledge in England to improve labelling been met? Addiction 2016;111:51–5.

[12] Alcohol Health Alliance UK. Drinking in the dark: How alcohol labelling fails consumers [Internet]. London; 2020. Available at: https://ahauk.org/wp-content/uploads/2020/08/DRINKING-IN-THE-DARK.pdf

[13] UK Parliament. Alcohol products: labelling [Internet]. UK Parliament 2021. Available at: https://hansard.parliament.uk/Commons/2021-04-27/debates/0B2B8535-CD50-4B2B-A17C-957276133A33/details.

[14] Critchlow N, Jones D, Moodie C et al. Awareness of product-related information, health messages and warnings on alcohol packaging among adolescents: a cross-sectional survey in the United Kingdom. J Public Health (Oxf) 2020;42:e223–30.

[15] Peddireddy S, Boniface S, Critchlow N, Newberry Le Vay J, Severi K, Vohra J. Factors associated with adolescents' support for product information and health messaging on alcohol packaging: a cross-sectional study in the United Kingdom. Alcohol Alcohol 2021 [Epub ahead of print]. Available at: https://doi.org/10.1093/alcalc/agab080.

[16] Critchlow N, Moodie C, Jones D. Health information and warnings on alcohol packaging in Ireland: it is time to progress the public health (alcohol) act 2018. Ir J Med Sci 2021 [Epub ahead of print]. doi: https://doi.org/10.1007/s11845-021-02719-8

[17] Blenkinsop P. EU lawmakers water down warnings on alcohol as cause of cancer [Internet]. Reuters 2022. Available at: https://www.reuters.com/business/healthcare-pharmaceuticals/eu-lawmakers-water-down-warnings-alcohol-cause-cancer-2022-02-16/.

[18] Noar SM, Hall MG, Francis DB, Ribis KM, Pepper JK, Brewer NT. Pictorial cigarette pack warnings: a meta-analysis of experimental studies. Tob Control 2016;25:341–54.

[19] Sillero-Rejon C, Maynard O, Ibáñez-Zapata JA. Visual attention to alcohol labels: an exploratory eye-tracking experiment. Adicciones 2020;32:202–7.

[20] Clarke N, Pechey E, Mantzari E et al. Impact of health warning labels communicating the risk of cancer on alcohol selection: an online experimental study. Addiction 2021;116:41–52.

[21] Winstock AR, Holmes J, Ferris JA, Davies EL. Perceptions of alcohol health warning labels in a large international cross-sectional survey of people who drink alcohol. Alcohol Alcohol 2020;55:315–22.

[22] Bell T. DrinkWell founder raises glass to increased calorie labelling on alcohol [Internet]. DrinkWell 2020. Available at: https://drinkwelluk.com/blogs/news/drinkwell-founder-raises-glass-to-increased-calorie-labelling-on-alcohol (accessed June 2021).

[23] Patton R, Boniface S. Prevalence of hazardous drinking among UK 18–35 year olds; the impact of a revision to the AUDIT cut score. Alcohol Alcohol 2016;51:281–2.

[24] Lehdonvirta V, Oksanen A, Räsänen P, Blank G. Social media, web, and panel surveys: using non-probability samples in social and policy research. Policy Internet 2021;13:134–55.

[25] Akers L, Gordon JS. Using Facebook for large-scale online randomized clinical trial recruitment: effective advertising strategies. J Med Internet Res 2018;20:e290.

[26] Pedersen ER, Naranjo D, Marshall GN. Recruitment and retention of young adult veteran drinkers using Facebook. PLoS One 2017;12:e0172972.

[27] Suresh K. An overview of randomization techniques: an unbiased assessment of outcome in clinical research. J Hum Reprod Sci 2011;4:8–11.

[28] Oral Health Foundation. State of mouth cancer UK report 2020/21 [Internet]. 2020. Available at: https://www.dentalhealth.org/thestateofmouthcancer

[29] YouGov. Alcohol brands: Smirnoff [Internet]. YouGov. 2020. Available at: https://yougov.co.uk/topics/food/explore/alcohol-brands/Smirnoff (accessed June 2020).

[30] Woolfson D. Britain's biggest alcohol brands 2019 report: generation sensible? [Internet] 2019. Available at: https://www.thegrocer.co.uk/britains-biggest-alcohol-brands/britains-biggest-alcohol-brands-2019-report-generation-sensible/595378.article

[31] Royal Society for Public Health. Towards better alcohol health information [Internet]. London; 2018. Available at: https://www.rsph.org.uk/static/uploaded/4ae31b49-c4d7-4355-ad94a660aba36108.pdf

[32] Pechey E, Clarke N, Mantzari E et al. Image-and-text health warning labels on alcohol and food: potential effectiveness and acceptability.

BMC Public Health 2020;20:376.

[33] National Readership Survey. Social grade [Internet]. National Readership Survey. Available at: http://www.nrs.co.uk/nrs-print/lifestyle-and-classification-data/social-grade/ (accessed 20 August 2019).

[34] Jones A, Earnest J, Adam M, Clarke R, Yates J, Pennington C. Careless responding in crowdsourced alcohol research: a systematic review and meta-analysis of practices and prevalence. Exp Clin Psychopharmacol 2022 [Epub ahead of print]. Available at. https://doi.org/10.1037/pha0000546.

[35] Gallis JA, Turner EL. Relative measures of association for binary outcomes: challenges and recommendations for the global health researcher. Ann Glob Health 2019;85:137.

[36] Ford A, MacKintosh AM, Moodie C, Richardson S, Hastings G. Cigarette pack design and adolescent smoking susceptibility: a cross-sectional survey. BMJ Open 2013;3:e003282.

[37] Mitchell D, Critchlow N, Moodie C, Bauld L. Reactions to, and trial intentions for, three dissuasive cigarette designs: a cross-sectional survey of adolescents in Scotland. Tob Control 2021;30:623–9.

[38] Annunziata A, Pomarici E, Vecchio R, Mariani A. Health warnings on wine: a consumer perspective. Br Food J 2016;118:647–59.

[39] Annunziata A, Vecchio R, Mariani A. Alcohol warnings and moderate drinking patterns among Italian university students: an exploratory study. Nutrients 2017;9:628.

[40] Gold N, Egan M, Londakova K et al. Effect of alcohol label designs with different pictorial representations of alcohol content and health warnings on knowledge and understanding of low-risk drinking guidelines: a randomized controlled trial. Addiction 2021;116:1443–59.

[41] Miller ER, Ramsey IJ, Baratiny GY, Olver IN. Message on a bottle: are alcohol warning labels about cancer appropriate? BMC Public Health 2016;16:139.

[42] Fernandes GS, Lewis G, Hammerton G et al. Alcohol consumption and internalising disorders in young adults of ALSPAC: a population-based study. J Epidemiol Community Health 2020;74:1023–7.

[43] Al-Hamdani M, Smith SM. Alcohol warning label perceptions: do warning sizes and plain packaging matter? J Stud Alcohol Drugs 2017;78:79–87.

[44] Jongenelis MI, Pratt IS, Slevin T, Chikritzhs T, Liang W, Pettigrew S. The effect of chronic disease warning statements on alcohol-related health beliefs and consumption intentions among at-risk drinkers. Health Educ Res 2018;33:351–60.

[45] Hammond D. Health warning messages on tobacco products: a review. Tob Control 2011;20:327–37.

[46] Wigg S, Stafford LD. Health warnings on alcoholic beverages: perceptions of the health risks and intentions towards alcohol consumption. PLoS One 2016;11:e0153027.

[47] Staub C, Fuchs C, Siegrist M. Risk perception and acceptance of health warning labels on wine. Food Qual Prefer 2022;96:104435.

[48] Annunziata A, Pomarici E, Vecchio R, Mariani A. Do consumers want more nutritional and health information on wine labels? Insights from the EU and USA. Nutrients 2016;8:416.

[49] Royal Society for Public Health. Increasing awareness of 'invisible' calories from alcohol [Internet]. 2014. Available at: http://www.rsph.org.uk/filemanager/root/site_assets/our_work/position_statements/alcohol_and_obesity_final.pdf

[50] International Alliance for Responsible Drinking. Beverage alcohol labeling requirements [Internet]. International Alliance for Responsible Drinking. 2019. Available at: http://iardwebprod.azurewebsites.net/science-resources/detail/Beverage-Alcohol-Labeling-Requirements (accessed July 2022).

[51] Tinawi G, Gray T, Knight T et al. Highly deficient alcohol health warning labels in a high-income country with a voluntary system. Drug Alcohol Rev 2018;37:616–26.

[52] Rumgay H, Shield K, Charvat H et al. Global burden of cancer in 2020 attributable to alcohol consumption: a population-based study. Lancet Oncol 2021;22:1071–80.

[53] Public Health England. Alcoholic liver deaths increased by 21% during year of the pandemic [Internet]. Gov.UK. 2021. Available at: https://www.gov.uk/government/news/alcoholic-liver-deaths-increased-by-21-during-year-of-the-pandemic (accessed August 2021).

[54] World Health Organisation. Alcohol labelling: a discussion document on policy options [Internet]. Copenhagen; 2017. Available at: https://www.euro.who.int/en/health-topics/disease-prevention/alcohol-use/publications/2017/alcohol-labelling-a-discussion-document-on-policy-options-2017

[55] Chudech S, Janmaimool P. Effectiveness of warning graphic labels on cigarette packs in enhancing late-teenagers' perceived fear of smoking-related harms in Bangkok. Thailand J Public Health Res 2021;10:1912.

[56] Coomber K, Hayley A, Giorgi C, Miller PG. A qualitative investigation of Australian young adult responses to pictorial and graphic alcohol product warnings. J Drug Issues 2017;47:622-37.

[57] Hall MG, Grummon AH, Lazard AJ, Maynard OM, Taillie LS. Reactions to graphic and text health warnings for cigarettes, sugar-sweetened beverages, and alcohol: an online randomized experiment of US adults. Prev Med (Baltim) 2020;137:106120.

[58] Sillero-Rejon C, Attwood AS, Blackwell AKM, Ibáñez-Zapata JA, Munafò MR, Maynard OM. Alcohol pictorial health warning labels: the impact of self-affirmation and health warning severity. BMC Public Health 2018;18:1403.

[59] Andrade C. The inconvenient truth about convenience and purposive samples. Indian J Psychol Med 2021;43:86–8.

[60] Ramke J, Palagyi A, Kuper H, Gilbert CE. Assessment of response bias is neglected in cross-sectional blindness prevalence surveys: a review of recent surveys in low- and middle-income countries. Ophthalmic Epidemiol 2018;25:379–85.

[61] Shamon H, Berning C. Attention check items and instructions in online surveys with incentivized and non-incentivized samples: boon or bane for data quality? Surv Res Methods 2020;14:55–77.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's website:

Table S1. Principal components analysis of warning response items.

Table S2. Appeal and social acceptability by warning condition.

Table S3. Cognitive and behavioural impact by warning condition.