

Full length article

# The impact of plain packaging and health warnings on consumer appeal of cannabis products

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## ABSTRACT

**Background:** Canada implemented 'plain packaging' regulations and rotating health warnings for cannabis products upon legalizing non-medical cannabis in October 2018. Plain packaging and health warnings are effective policy measures for reducing appeal of tobacco products; however, there is little evidence in the cannabis domain.

**Methods:** An experimental task was conducted as part of the online International Cannabis Policy Study. Participants aged 16–65 from Canada (n = 9987) and US states with 'legal' (n = 7376) and 'illegal' (n = 9682) recreational cannabis were randomly assigned to see one of 18 cannabis product images. Outcomes were product appeal (0 = Not at all appealing, 10 = Very appealing) and perceived youth orientation (4 age groups). A 3 (branding: full branding, brand logo only, or plain black packaging) x 2 (health warning labels: present or absent) x 3 (product type: edible gummies, cannabis oil, or pre-rolled joints) factorial design was used.

**Results:** Compared to plain packaging or a brand logo, packages with full branding were considered more appealing and more likely to be youth-oriented (p < 0.001). Products with health warnings were considered less appealing than packages without warnings (p < 0.001). Edible gummies were perceived as more appealing and more likely to be youth-oriented than pre-rolled joints and cannabis oil (p < 0.001). Additionally, edible gummies were rated as significantly more appealing by 16–18 and 19–35-year-olds than by older adults (p < 0.02 for all).

**Conclusions:** Comprehensive health warnings and 'plain packaging' regulations may reduce the appeal of cannabis products in a legal market. The results also provide empirical evidence that edible gummies are perceived to appeal to youth.

## 1. Introduction

On October 17, 2018, Canada became the second country after Uruguay to legalize the sale and possession of recreational (non-medical) cannabis (El Senado y la Cámara de Representantes de la República Oriental del Uruguay, 2013; Parliament of Canada, 2018). Legalization is occurring in two broad stages: purchase of dried/fresh herb and some oils were permitted in October 2018, while cannabis 'edibles', concentrates and remaining products will be available for sale by October 2019 (Government of Canada, 2018a). In the USA, while cannabis remains a Schedule I (illicit) drug at the federal level (United States Drug Enforcement Administration, 2019), to date, 11 states and the District of Columbia have legalized the possession (and in most cases, sale) of non-medical cannabis (National Cannabis Industry Association, 2019).

Cannabis use is prevalent in North America, with 22.2% of

Canadians aged  $\geq 16$  years and 9.6% of Americans aged  $\geq 12$  years reporting past-month cannabis use (Government of Canada, 2018b; Substance Abuse and Mental Health Services Administration, 2018). Packaging and labelling regulations are an important component of cannabis control measures in legal markets. In both Canada and US states that have legalized non-medical cannabis (US 'legal' states), cannabis products are required to display product information (such as cannabinoid concentrations and quantity) and a universal symbol indicating that the product contains cannabis or tetrahydrocannabinol (THC), and must use opaque and/or child-resistant packaging (Alaska Department of Commerce and Economic Development, 2019; California Department of Public Health, 2019; Colorado Department of Revenue, 2013; Oregon Liquor Control Commission, 2018; State of Maine, 2019; State of Massachusetts, 2018; State of Nevada Department of Taxation, 2017; Washington State Legislature, 2019). Mandatory health warnings on packages are also required in Canada and most US 'legal' states. The

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warning statements used in US states typically constitute black text on a white background, often presented as lengthy blocks of text (see Supplementary Material)\* (Alaska Department of Commerce and Economic Development, 2019; California Legislative Information, 2018; State of Nevada Department of Taxation, 2017; Washington State Liquor and Cannabis Board, 2018). In contrast, Canada requires one of six rotating health warnings that communicate the risks of: use during pregnancy; addiction; impaired driving/operating machinery; harmful chemicals in cannabis smoke; use among adolescents; and psychosis and schizophrenia (Government of Canada, 2018c). Canadian regulations also include requirements to enhance the overall salience of warnings: the font size of text must be equal or greater to that of the product's brand name and must be printed on a yellow background with a black border to contrast product packaging. As shown in Fig. 1, a standardized cannabis symbol that indicates the presence of THC is also required in the upper left 25% of the package (Government of Canada, 2019b).

A large body of research has demonstrated that health warnings can increase perceptions of risk and reduce product appeal and consumption (Hammond, 2011; Noar et al., 2016). However, the impact of warnings depends on their size and location: large warnings that are prominently displayed and include pictures are substantially more effective than smaller, obscure warnings (Hammond, 2011). To date, however, there is little evidence to date on the impact of health warnings on cannabis products (e.g., Mutti-Packer et al., 2018).

In addition to communicating potential health risks, packaging also serves as an important form of product promotion (Moodie and Hastings, 2010). Packages act as a primary vehicle for communicating a product's brand imagery, which aims to establish positive associations and product attributes (Cummings et al., 2002; Hoek et al., 2012; US Surgeon General, 2012; Wakefield et al., 2002). Research from other consumer domains, such as tobacco and alcohol, has demonstrated that a product's appearance can influence consumer behaviour and helps market a product to a particular target group (Cranwell et al., 2017; Johnson et al., 2016; McNeill et al., 2017). Packaging can also include specific characteristics that increase a product's appeal, such as colour, flavour, and images targeting a specific audience (e.g., youth, women). For instance, lighter colours can be used to enhance brand recognition and communicate messages of reduced harm and potency, and higher product quality (Etzel and Monahan, 1979; Hammond et al., 2009; US Department of Health and Human Services, 2012).

In US 'legal' states, there are few restrictions on the use of brand imagery on packages. In comparison, the *Cannabis Act* in Canada includes more restrictive regulations on advertising and promotion, including packaging. Canada currently prohibits the sale of cannabis with a package or label that: could appeal to young people; contains a testimonial or endorsement; depicts people, characters or animals; or associates the product or its brand elements with a lifestyle that includes glamour, recreation, excitement, vitality, risk or daring (Government of Canada, 2019a). Manufacturers are permitted to choose a packaging colour, although only one colour is permitted. In addition, all brand imagery is restricted to a space no larger than the required cannabis symbol (Government of Canada, 2019b), as illustrated in Fig. 1. These regulations are similar to 'plain packaging' regulations for tobacco products, which generally prohibit brand imagery and require all packages to use one standard colour. Research to date on tobacco products indicates that plain packaging reduces the appeal of tobacco products, makes it more difficult to 'target' subgroups (such as young females), and increases perceptions of risk (Biener and Siegel, 2000; Smee and Parsonage, 1992; US Department of Health and Human Services, 2014; US Surgeon General, 2012). To date, only one study has examined the effect of plain packaging and health warnings on cannabis products, finding that branded packs without health warnings

were considered most appealing to young adults (Mutti-Packer et al., 2018).

The primary objective of the current study was to examine the influence of branding and health warnings on cannabis product appeal and perceived youth orientation (i.e., perception of the product to target/appeal to young people). Three product types were tested: edible cannabis-infused gummy candies, cannabis oil (cannabis extract dissolved in oil and typically administered with a dropper or syringe), and dried herb packaged as pre-rolled joints. The study also examined the interactions between branding, health warnings and product type, as well as branding, product type, and age. It was expected that the presence of branding would be associated with increased product appeal and youth orientation; the presence of health warnings would decrease product appeal; and edible products would appeal more to younger individuals and be perceived as more youth-oriented than other product types.

## 2. Methods

### 2.1. Participants

Data are from Wave 1 of the International Cannabis Policy Study (ICPS), conducted in Canada and the USA. Data were collected via self-completed web-based surveys conducted from August 27–October 7, 2018 with participants aged 16–65 years (Hammond et al., 2018). Participants were recruited through the Nielsen Consumer Insights Global Panel and their partners' panels. Email invitations (with a unique link) were sent to a random sample of panelists (after targeting for age and country criteria). Surveys were conducted in English in the US and English or French in Canada (based on the panelist's known language preference). Median survey time was 19.9 min.

A total of 28,471 participants completed the survey. A total of 27,169 participants were retained in the ICPS analytic sample after removing participants with invalid responses to data quality questions, ineligible country of residence, smartphone use or residence in District of Columbia ( $n = 1302$ ); the current analysis comprised 27,045 participants after excluding those missing data on the two main outcomes (product appeal and youth orientation;  $n = 35$ ) or on education level ( $n = 89$ ). A full description of the study methods and exclusion criteria can be found in the International Cannabis Policy Study Technical Report (Goodman and Hammond, 2018).

#### 2.1.1. Procedure and study design

Participants provided consent prior to completing the survey. Participants received remuneration in accordance with their panel's usual incentive structure (e.g., points-based or monetary rewards, chances to win prizes). The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE# 22392).

The current paper describes the results of a between-groups experiment administered as part of the online survey. Participants were randomized to see one of 18 cannabis product images according to a 3 (branding: full branding, brand logo only, or plain black packaging) x 2 (health + THC warning labels: present or absent) x 3 (product type: edible gummies, cannabis oil, or pre-rolled joints) factorial design (see Fig. 2a–c). The 'plain packaging' and 'brand logo only' conditions were based on examples provided in Canada's regulatory documents (Government of Canada, 2018d). The background imagery used in the 'full branding' conditions was based on branding of real products on the US online market. The health warning displayed on packages was selected from one of the six required in Canada (Government of Canada, 2018c). To avoid associations with real cannabis brands, a popular strain of cannabis ('Sour Diesel') was selected as the brand name.

#### 2.1.2. Measures

The product image was displayed on the screen while participants

\* Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi: ...



Example of FRONT (principal display panel) with white/plain background and brand/producer name



Example of BACK (secondary display panel) with white/plain background



Example of FRONT (principal display panel) with solid coloured background and brand/producer logo



Example of BACK (secondary display panel) with solid coloured background

Fig. 1. Legal cannabis packaging in Canada. Source: Government of Canada (2018). Available at: <https://www.canada.ca/en/health-canada/services/publications/drugs-health-products/summary-comments-public-consultation-regulation-cannabis.html>.

answered two questions. First, ‘product appeal’ was measured by asking: “How appealing would this marijuana product be to try?” (11-point Likert scale, 0 = Not at all appealing to 10 = Very appealing, Don’t know, Refuse). ‘Youth orientation’ of the product was assessed by asking: “In your opinion, what age group would be most likely to try this product?” (12-18-year olds, 19-30-year olds, 30-40-year olds, People over 40, Don’t know, Refuse).

Demographic measures included sex, age group, ethnicity, highest level of education, cannabis use, and jurisdiction (Canada, US ‘legal’ states, and states that had not legalized non-medical cannabis [US ‘il-legal’ states]). A 6-level ‘cannabis use status’ variable with exclusive categories (Never user; Used more than 12 months ago; Used in past 12 months; Monthly user; Weekly user; Daily/almost daily user) was derived from three survey questions on prevalence of use. For full item wording, see the ICPS 2018 (Wave 1) survey (Hammond et al., 2018).

### 2.1.3. Data analysis

Chi-square test was used to test for differences in socio-demographic factors between experimental conditions to examine whether randomization was successful in balancing groups. Regression models were conducted to examine the effect of experimental condition on the two outcomes. Product appeal was analyzed as a continuous outcome using linear regression (range = 0–10). Perceived youth orientation of the product was analyzed using binary logistic regression (0 = 12-18-year-olds; 1 = other age/don’t know). In both models, indicator variables were included for the following independent variables: branding (0 = plain package; 1 = brand logo only; 2 = full branding); health warning (0 = no warning; 1 = health + THC warning); and product type (0 = edible gummies; 1 = cannabis oil; 2 = pre-rolled joints). The following variables were forced into regression models in the same step: sex, age group, ethnicity, education level, jurisdiction, and cannabis use status (see Table 1 for response categories). In subsequent models, two-way interactions (branding x product type; health warning x product



Fig. 2. Experimental packaging manipulations: a) Edible gummies; b) Cannabis oil; c) Pre-rolled joints.

type; branding x health warning; age group x product type; age group x branding) (model 2) and three-way interactions (branding x product type x health warning) (model 3) were examined. Unless otherwise indicated, adjusted odds ratios (AORs), unstandardized betas ( $\beta$ ), and 95% confidence intervals (CIs) are reported. Statistical analyses were conducted using SPSS version 25 (IBM Corp.).

### 3. Results

Table 1 shows the sample characteristics; mean age was 44.5 (SD = 15.5) years. There were no significant differences across

experimental conditions in demographic covariates (sex, age group, ethnicity, education, cannabis use, or jurisdiction) ( $p > 0.05$  for all).

#### 3.1. Product appeal

Fig. 3 shows mean appeal of cannabis products by experimental condition; mean appeal ratings for cannabis oil, pre-rolled joints and edible gummies were 2.76, 2.94 and 3.36, respectively. Table 2 shows the results of the linear regression examining the impact of experimental condition on product appeal. Significant main effects of branding, product type and health warning were observed. Participants



**Table 1**  
Sample characteristics of International Cannabis Policy Study 2018 participants who responded to at least one experimental question (n = 27,045).

Variable	n (%)
Sex	
Female	16,631 (61.5%)
Male	10,414 (38.5%)
Age group	
16-18	2,821 (10.4%)
19-35	5,417 (20.0%)
36-50	6,760 (25.0%)
51-65	12,047 (44.5%)
Ethnicity	
White	22,744 (84.1%)
Other/Mixed/Unstated	4,301 (15.9%)
Education	
Less than high school	2,875 (10.6%)
High school diploma or equivalent	4,113 (15.2%)
Some college <sup>a</sup>	9,747 (36.0%)
Bachelor's degree or higher	10,310 (38.1%)
Jurisdiction	
Canada	9,987 (36.9%)
US 'illegal' states	9,682 (35.8%)
US 'legal' states	7,376 (27.3%)
Cannabis use status	
Never user	11,208 (41.4%)
Used > 12 months ago	9,113 (33.7%)
Past 12-month user	2,252 (8.3%)
At least monthly user	1,260 (4.7%)
At least weekly user	1,117 (4.1%)
Daily/almost daily user	2,095 (7.7%)

<sup>a</sup> Includes some college technical/vocational training, college certificate/diploma, apprenticeship, or some university.

shown packages with full branding rated products as significantly more appealing than those who saw plain packaging or a brand logo only. There was no significant difference in appeal between products with plain packaging vs. brand logo only. Participants shown packages with a warning label rated product as significantly less appealing than those shown packages without a warning. Finally, those shown edible gummies rated the product as significantly more appealing than those shown pre-rolled joints or cannabis oil. In contrast, those shown cannabis oil rated the product as significantly less appealing than those shown gummies or pre-rolled joints. Pre-rolled joints were significantly more appealing than cannabis oil. We also observed significant main effects of all tested covariates, with the exception of education (Table 1). Briefly, males, younger participants (compared to 51–65-year-olds), non-Caucasian respondents, more frequent cannabis users, and participants in US illegal states rated products as more appealing than their counterparts.

There was a significant two-way interaction between branding and product type ( $\chi^2(4) = 23.55, p < 0.001$ ). Specifically, participants who saw edible gummies or pre-rolled joints rated the products as more appealing when shown fully branded packages than when shown plain packaging or a brand logo only (Fig. 4). There were no significant

**Table 2**  
Linear regression (main effects model): Effect of experimental product condition on product appeal (n = 25,422).

Experimental condition	X <sup>2</sup> (df)	β	95% CI	p-value
Branding condition	49.14 (2)			< 0.001
Brand logo only vs. plain packaging (ref)		0.06	-0.03, 0.15	0.218
Full branding vs. plain packaging (ref)		0.31	0.22, 0.40	< 0.001
Full branding vs. brand logo (ref)		0.25	0.16, 0.34	< 0.001
Health warning condition	37.96 (1)			< 0.001
Warning vs. no warning (ref)		-0.23	-0.31, -0.16	< 0.001
Product type condition	153.93 (2)			< 0.001
Edible gummies vs. cannabis oil (ref)		0.56	0.47, 0.65	< 0.001
Edible gummies vs. pre-rolled joints (ref)		0.40	0.31, 0.49	< 0.001
Pre-rolled joints vs. cannabis oil (ref)		0.15	0.06, 0.25	0.001
Age group	803.60 (3)			< 0.001
16-18		0.92	0.73, 1.12	< 0.001
19-35		1.40	1.30, 1.50	< 0.001
36-50		0.88	0.78, 0.97	< 0.001
51-65 (ref)		-	-	-
Sex	307.40 (1)			< 0.001
Male vs. female (ref)		0.69	0.62, 0.77	< 0.001
Ethnicity	44.33 (1)			< 0.001
Other/Unstated/Mixed vs. White (ref)		0.35	0.25, 0.46	< 0.001
Education level	5.12 (3)			0.16
Less than high school (ref)		-	-	-
High school diploma or equivalent		0.03	-0.16, 0.22	0.764
Some college		-0.02	-0.21, 0.16	0.805
Bachelor's degree or higher		0.08	-0.11, 0.27	0.422
Jurisdiction	220.83 (2)			< 0.001
Canada (ref)		-	-	-
US 'illegal' states		0.61	0.52, 0.70	< 0.001
US 'legal' states		0.01	-0.08, 0.11	0.811
Cannabis use status	6260.67 (5)			< 0.001
Never user (ref)		-	-	-
Used > 12 months ago		1.36	1.27, 1.45	< 0.001
Past 12-month user		2.67	2.53, 2.81	< 0.001
At least monthly user		4.00	3.82, 4.18	< 0.001
At least weekly user		4.25	4.06, 4.44	< 0.001
Daily/almost daily user		4.50	4.35, 4.65	< 0.001

Note: X<sup>2</sup> = Wald Chi-square; β = unstandardized beta coefficient; CI = confidence interval; ref = reference group; SE = standard error. Perceived appeal measured as continuous variable (range 0–10) with all variables entered in one step.

interactions between health warning and either branding or product type. The tested interaction between branding, health warning and product type was also non-significant. Finally, while there was no



Fig. 3. Appeal of each cannabis product, by experimental condition (n = 25,422).

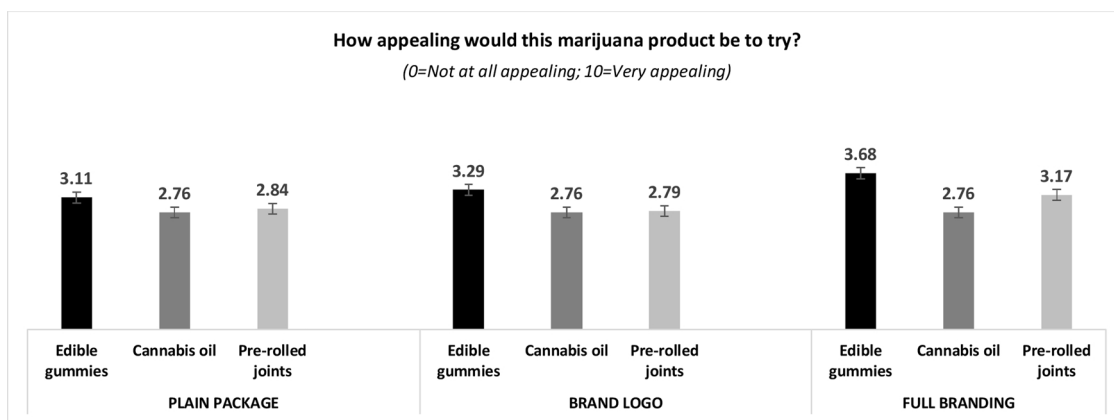


Fig. 4. Two-way interaction between branding x product type on mean product appeal (n = 25,422).

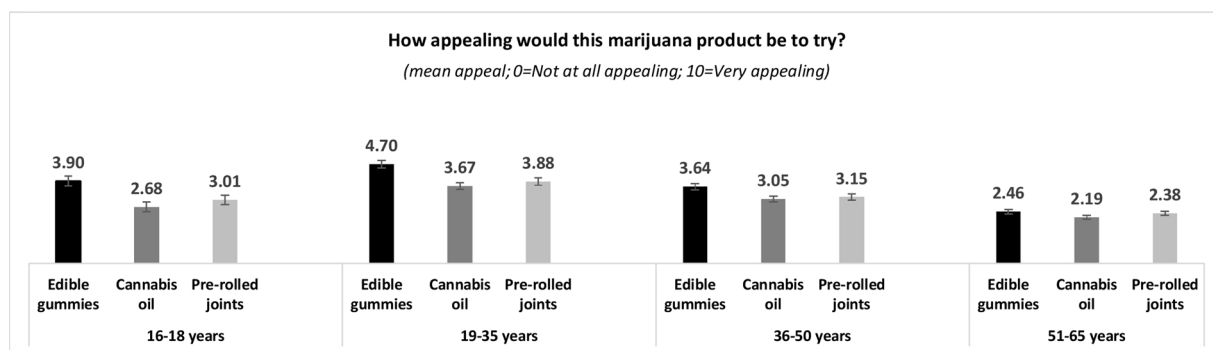


Fig. 5. Two-way interaction between product type x age group on product appeal (n = 25,422).

significant interaction between branding and age, there was a significant two-way interaction between product type and age ( $\chi^2(6) = 87.25, p < 0.001$ ). Specifically, as shown in Fig. 5, product appeal was highest among young adults (19–35 years) shown edible gummies ( $p < 0.02$  for all contrasts). With the exception of 19–35-year-olds shown edible gummies, appeal was also significantly higher among 16–18-year-olds shown edible gummies compared to cannabis oil or pre-rolled joints ( $p < 0.001$  for both), or compared to any other age group shown any product type ( $p < 0.01$  for all contrasts). Pre-rolled joints were rated as significantly more appealing by 19–35-year-olds than all other age groups ( $p \leq 0.01$  for all). Product appeal was lowest among 51–65-year-olds shown cannabis oil ( $p < 0.05$  for all contrasts). Finally, although edible gummies were rated as most appealing overall, followed by pre-rolled joints, the influence of product type decreased with age: appeal ratings did not significantly differ between 19–35-year-olds shown cannabis oil vs. pre-rolled joints ( $p = 0.13$ ), 36–50-year-olds shown cannabis oil vs. pre-rolled joints ( $p = 0.90$ ) or 51–65-year-olds shown gummies vs. pre-rolled joints ( $p = 0.33$ ).

### 3.2. Youth orientation

Fig. 6 shows the proportion of participants perceiving the cannabis product to appeal to 12–18-year old consumers (herein ‘youth orientation’), by experimental condition. Edible gummies were three times more likely to be perceived as youth oriented than was cannabis oil: proportions perceiving cannabis oil, pre-rolled joints and edible gummies to be youth oriented were 13.0%, 18.8%, and 40.2%, respectively. Table 3 shows the results of the logistic regression examining the impact of experimental condition on perceived youth orientation. Significant main effects of branding and product type were observed. Participants shown packages with full branding rated products as more likely to be youth-oriented than those who saw plain packaging or a

brand logo only. There was no significant difference in perceived youth orientation between products with plain packaging vs. brand logo only. Additionally, those shown edible gummies were more likely to perceive them as youth-oriented compared to those shown pre-rolled joints or cannabis oil. In contrast, those shown cannabis oil were less likely to perceive it as youth-oriented compared to those shown gummies or pre-rolled joints. We also observed significant main effects of all tested covariates (Table 3). Briefly, males, non-Caucasian participants, those in US jurisdictions and those who had used cannabis within the past year were less likely to perceive products as youth-oriented compared to their counterparts. Youth aged 16–18 were significantly more likely to perceive products as youth-oriented than the oldest age group (51–65-year-olds), whereas those aged 19–35 and 36–50 were less likely.

Significant two-way interactions were observed for branding by product type ( $\chi^2(4) = 42.38, p < 0.001$ ) and branding by health warning ( $\chi^2(2) = 20.12, p < 0.001$ ), and a significant three-way interaction was observed for branding by health warning by product type ( $\chi^2(4) = 27.41, p < 0.001$ ). As Fig. 7 shows, the effect of the warning label was greatest among participants shown fully branded pre-rolled joints; in other words, when shown a fully branded pack of pre-rolled joints with no health warning, they were more likely to believe the product was youth oriented.

## 4. Discussion

This study is among the first to experimentally test the impact of packaging attributes on consumer perceptions of cannabis products. Firstly, our findings demonstrate that products with less branding were perceived as less appealing and less likely to be youth-oriented than those with full branding. These findings are consistent with the few studies examining the impact of branding on appeal of cannabis products (Leos-Toro, 2019; Mutti-Packer et al., 2018). The results also

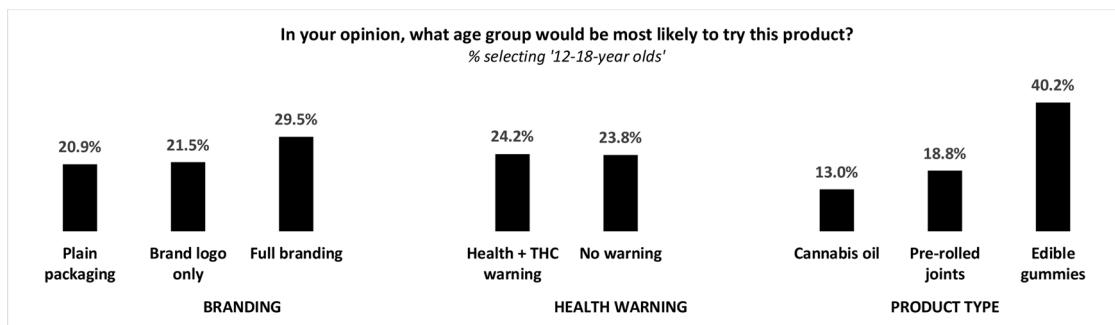


Fig. 6. Percentage of participants perceiving the product to be youth-oriented, by experimental condition (n = 26,927).

Table 3

Logistic regression (main effects model): Effect of experimental product condition on youth orientation of product (n = 26,927).

Experimental condition	X <sup>2</sup> (df)	AOR	95% CI	p-value
Branding condition	249.97 (2)	–	–	< 0.001
Brand logo only vs. plain packaging (ref)		1.04	0.97, 1.12	0.278
Full branding vs. plain packaging (ref)		1.67	1.56, 1.80	< 0.001
Full branding vs. brand logo (ref)		1.61	1.49, 1.73	< 0.001
Health warning condition	0.78 (1)			0.377
Warning vs. no warning (ref)		0.97	0.92, 1.03	0.377
Product type condition	1962.67 (2)			< 0.001
Edible gummies vs. cannabis oil (ref)		4.84	4.49, 5.23	< 0.001
Edible gummies vs. pre-rolled joints (ref)		3.06	2.86, 3.28	< 0.001
Pre-rolled joints vs. cannabis oil (ref)		1.58	1.46, 1.72	< 0.001
Age group	134.10 (3)			< 0.001
16-18		1.52	1.31, 1.76	< 0.001
19-35		0.70	0.64, 0.76	< 0.001
36-50		0.80	0.74, 0.86	< 0.001
51-65 (ref)		–	–	–
Sex	91.91 (1)			< 0.001
Male vs. female (ref)		0.74	0.69, 0.78	< 0.001
Ethnicity	15.78 (1)			< 0.001
Other/Unstated/Mixed vs. White (ref)		0.84	0.77, 0.92	< 0.001
Education level	14.00 (3)			0.003
Less than high school (ref)		–	–	–
High school diploma or equivalent		0.84	0.71, 0.97	0.020
Some college		0.98	0.84, 1.13	0.736
Bachelor's degree or higher		0.99	0.85, 1.15	0.869
Jurisdiction	82.53 (2)			< 0.001
Canada (ref)		–	–	–
US 'illegal' states		0.73	0.68, 0.79	< 0.001
US 'legal' states		0.78	0.73, 0.85	< 0.001
Cannabis use status	315.77 (5)			< 0.001
Never user (ref)		–	–	–
Used > 12 months ago		1.13	1.05, 1.21	0.001
Past 12-month user		0.85	0.75, 0.95	0.004
At least monthly user		0.52	0.44, 0.61	< 0.001
At least weekly user		0.44	0.37, 0.53	< 0.001
Daily/almost daily user		0.42	0.37, 0.49	< 0.001

Note: X<sup>2</sup> = Wald Chi-square; AOR = adjusted odds ratio; CI, confidence interval; df, degrees of freedom; ref, reference group. Youth orientation measured as binary variable (1 = 12-18-year-olds; 0 = other) with all variables entered in one step.

align with previous research on the effects of branding and packaging on tobacco and alcohol products, which demonstrate the importance of packaging as a promotional tool and the positive impact of restricting brand imagery (Cranwell et al., 2017; Johnson et al., 2016; McNeill et al., 2017).

Although mean ratings of appeal were low (< 4 out of 10) in

general, examination of socio-demographic factors revealed that overall, product appeal was greater among certain subsets of the population, including males and more frequent cannabis users. This is consistent with previous research (Mutti-Packer et al., 2018) and logical given that cannabis users would be more likely to find cannabis products appealing than non-users. Moreover, we found that cannabis edibles were more appealing among 16–18-year-olds (who represent minors in most jurisdictions) and young adults (vs. older adults). In the wake of the legalization of cannabis edibles, concentrates and other product types in Canada (Government of Canada, 2018e), restrictions in the form of plain packaging may be particularly important to reduce product appeal among young people. On that note, it is important to acknowledge that the Canadian restrictions on branding of cannabis products tested in the current study were referred to herein as “plain packaging,” but were less restrictive than the plain packaging regulations that apply to tobacco cigarettes (Government of Canada, 2019c). No differences were observed between the experimental condition with zero brand imagery (which is more akin to the tobacco regulations) and the condition with limited branding (brand logo only), which is more representative of Canada’s cannabis regulations. The “fully branded” packages used in the current study also tested a full array of colours; future research should examine whether differences in packaging colours—such as eye-catching, or female-oriented colours (e.g., pink) vs. the standard brown colour allowed under Canada’s current tobacco regulations (Government of Canada, 2019c)—influence cannabis product appeal.

Secondly, the current study also demonstrated that large, salient health warnings with contrasting colours reduce the appeal of cannabis products, above and beyond the effects of health warnings or product type. This aligns with research on tobacco warning labels (Hammond, 2011) as well as two recent studies which found that the use of health warnings reduced the appeal of cannabis products (Leos-Toro, 2019; Mutti-Packer et al., 2018). In a recent study, the majority of young adults supported placing health warning messages on cannabis products. In addition, pictorial health warnings were rated as more effective than text-only warnings (Leos-Toro et al., 2019); future studies should test whether pictorial health warnings are more effective at decreasing cannabis product appeal than text-based warnings. Furthermore, we tested the warning label design used on cannabis products in Canada (Government of Canada, 2018d); next steps would be to examine differences in these labels vs. the various warning labels used in US ‘legal’ states, as well as differences in perceptions of risk associated with different warning labels.

Thirdly, the current study provides empirical evidence consistent with anecdotal evidence that certain types of cannabis edibles are more appealing than others, especially among young people (Canadian Centre on Substance Abuse and Addiction, 2019), and should be prohibited as they violate the Cannabis Act’s specific aims of discouraging use by youth (de Villa, 2019; Government of Canada, 2018d). In the current study, edible gummies were significantly more likely to be perceived as youth-oriented compared to pre-rolled joints or cannabis

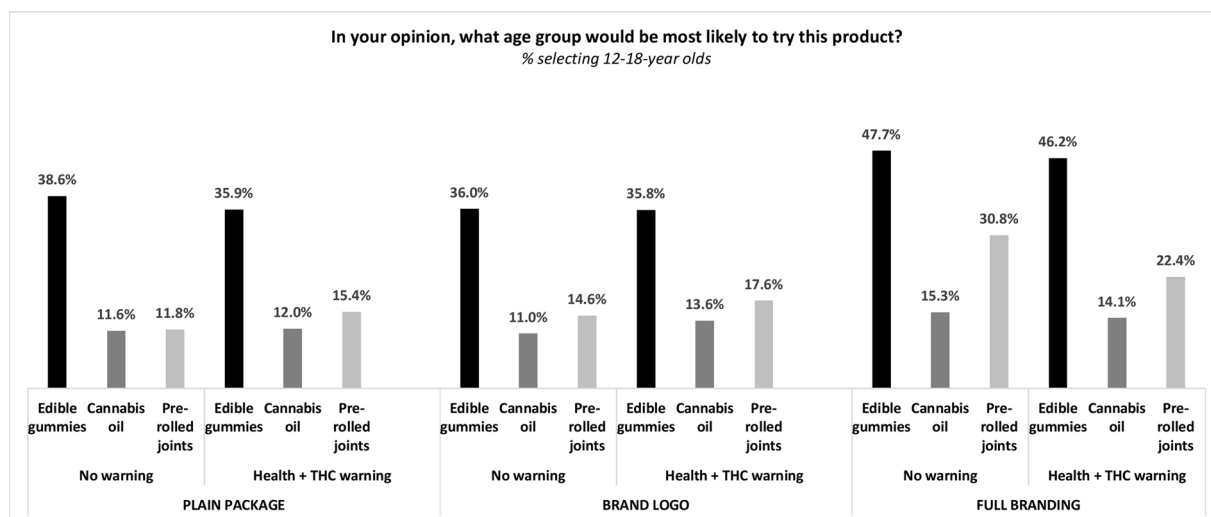


Fig. 7. Three-way interaction between branding x health warning x product type on perceived youth orientation of product (n = 26,927).

oil. Although edible gummies were the most appealing product overall, we found that the effect of product type differed by age, whereby the highest appeal ratings were observed among young adults (19–35 years) who saw edible gummy packages. Moreover, gummies were significantly more appealing among youth aged 16–18 than adults aged 36–50 and 51–65 years. Our study also showed that the effect of branding was amplified among certain product categories—in this case edible gummies and pre-rolled joints compared to cannabis oil. In qualitative research, participants expressed concern surrounding the appeal of cannabis packages to children, and felt it was often unclear that edible products contained cannabis (Kosa et al., 2017). Together with our results, these findings suggest the importance of tight restrictions on branding, mandated health warnings and THC symbols that curb product appeal and indicate the presence of cannabis. Although several US ‘legal’ states prohibit products that appeal to young people (Alaska Department of Commerce and Economic Development, 2019; California Department of Public Health, 2018; Colorado Department of Revenue, 2013; State of Maine, 2019; State of Massachusetts, 2018; State of Nevada Department of Taxation, 2017; Washington State Legislature, 2019), none have prohibited specific products to date. Similarly, while Canada has proposed that cannabis edibles and concentrates should not appeal to children and Quebec health officials have proposed a ban on cannabis edibles that appeal to youth (CBC News, 2019; Government of Canada, 2018e), specific regulations or prohibitions on specific product types have yet to be announced.

#### 4.1. Limitations

This study is subject to limitations common to survey research. Participants were recruited using non-probability-based sampling; therefore, the findings do not provide nationally representative estimates. However, this was an experimental study in which the distribution of socio-demographic factors (age, sex, ethnicity, education, cannabis use and jurisdiction) was randomized across conditions. This study also used an online format to test the appeal of product packaging, and mean ratings of appeal were fairly low overall. Higher salience of packaging elements would be expected in a retail environment where consumers can interact with packages and compare them with competing products. Although three product types were tested, results may have differed for different product types, brand imagery or product descriptors. For example, the use of flavour descriptors, traditionally female colour schemes (e.g., pink and white) or branding that elicited images of glamour, slimness, self-confidence, freedom or sophistication

may have appealed more to young women (Hammond et al., 2013; Kaleta et al., 2011). Although the brand name was changed, the brand imagery used for the full branding condition was based on a real brand available in the US online market. Although it is possible that this branding was familiar to some US cannabis users, appeal ratings were no higher among those in US legal markets.

#### 5. Conclusions

Similar to research in tobacco (Hammond et al., 2013; Johnson et al., 2016; McNeill et al., 2017), the presence of brand imagery increased consumer appeal of cannabis products, whereas plain packaging generally had the opposite effect. Certain cannabis products—such as cannabis-infused gummy candy—are inherently more appealing and more likely to entice young people than other product types. The effect of brand imagery and health warning labels may be even more salient among products targeted at youth or recreational users (e.g., edibles, concentrates, pre-rolled joints) than among traditionally ‘therapeutic’ products such as cannabis oil or topical ointments. Taking a harm reduction approach, jurisdictions developing regulations surrounding the packaging of recreational cannabis products should consider placing restrictions on branding and implementing health warnings to decrease the appeal of these products in a legal market. Plain packaging may be particularly important in markets such as Canada, which has comprehensive restrictions on advertising and promotion in other marketing channels. Indeed, research in tobacco has shown that the importance of packaging increases when other forms of advertising are restricted (Moodie et al., 2014).

#### Author disclosures and contributors

Samantha Goodman and David Hammond designed the experimental task and contributed substantially to survey development. Samantha Goodman analyzed the data and prepared the first draft of the manuscript. David Hammond and Cesar Leos-Toro revised the manuscript.

The authors warrant that the article is the authors' original work, has not been published elsewhere, and is not under consideration for publication elsewhere.

All authors have seen and approved the final version of the manuscript.



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## Declaration of Competing Interest

No conflict declared.

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None.

## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.drugalcdep.2019.107633>.

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