The efficacy of health warnings and package branding on perceptions of cannabis products among youth and young adults

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Abstract

Introduction. *Little empirical evidence exists about the efficacy of labelling and marketing restrictions in a regulated cannabis market. This study examined perceptions of cannabis product packaging designs, health warning labels (HWL) and perceptions of packs displaying brand imagery and leading descriptors on measures of appeal, and perceived consumer attributes.* **Methods.** *An online experimental survey of Canadian cannabis users and non-users (*n = 870*) aged 16–30 years containing eight between-group experiments was conducted in October 2017. Primary outcomes were appeal and perceived consumer attributes of cannabis product packaging, including the likelihood of being younger, female, fashionable, health conscious and likely to go out and party.* **Results.** *When cannabis product branding was present, respondents were more likely (*P = 0.027*) to report greater appeal than when branding was absent. When an HWL was present, respondents were less likely (*P = 0.010*) to report greater appeal than when absent. The presence of a celebrity sponsor (*P < 0.001*), music references (*P < 0.001*) or party references (*P < 0.001*) increased the likelihood that respondents perceived the product as targeted at someone younger, and a party lifestyle. Differences by cannabis use status were observed across experiments; those who had used were more likely to find branding elements appealing.* **Discussion and Conclusions.** *The findings demonstrate that brand imagery on cannabis packaging can promote lifestyle associations and increase the appeal of cannabis products among young people. Plain/standardised packs displaying HWLs were perceived as less appealing than packs with branding or without HWLs. Lifestyle associations can be communicated through brand imagery on cannabis packaging.* [Leos-Toro C, Fong GT, Hammond D. The efficacy of health warnings and package branding on perceptions of cannabis products among youth and young adults. *Drug Alcohol Rev* 2021]

Key words: health warning labels, HWLs, packaging design, cannabis warning labels.

Introduction

Advertising and promotion have a strong influence on consumer health behaviours, such as tobacco use [1–4]. Advertising can influence perceptions of risks, as well as positive associations between smoking and desirable outcomes, such as independence, social approval, sexual attraction and thinness. Packaging represents an important component of product marketing and serves as a cornerstone of brand imagery, which encompasses logos, colours and other brand identities. Brand imagery encourages consumers to draw inferences about the contents of a package and the likely experience they will have as a result of consuming the product, including social identities [5–8].

Evidence from the tobacco and alcohol research domains indicates that the appearance of a product influences initiation of use, increased consumption and brand loyalties [9–13]. For example, lighter colours communicate cues that elicit perceptions of reduced harm and strength, superior quality and better brand recognition [14–18]. Health-oriented descriptors have been shown to increase intentions to purchase, increase generally favourable perceptions and reduce perceived harm associated with the product's use [19]. Products presented in slim and thin designs increase attractiveness (particularly among women), communicate milder content and are perceived as less harmful [20–22]. In contrast, plain/standardised packaging has been observed to elicit less perceived appeal, be perceived as less attractive, promote less projections of personality attributes (i.e. cool), reduce perceptions

of implied safety and be perceived as less sophisticated than packs that display branding elements.

To date, few studies have investigated the impact of cannabis-specific marketing and its influence on consumer behaviour. Research conducted in the USA suggests widespread exposure to cannabis advertising, particularly through digital media [23,24]. A study conducted in Oregon following the legalisation of non-medical cannabis in 2015 indicated higher levels of exposure to cannabis marketing than general US samples, primarily via storefronts, street signs and billboards [25]. In California, exposure to medical cannabis advertisements among sixth and eighth graders was associated with a greater likelihood of cannabis use and stronger intentions to use 1 year later [26]. Brain imaging studies suggest that cannabis marketing produces similar brain reactivity and reward cues as marketing for alcohol and tobacco products [27].

Packaging serves as an important channel for communicating health risks through product labels and health warnings. In tobacco control, health warning labels (HWLs) have proven to be the most cost-effective medium to communicate information related to a product's health risks [28]. Large pictorial HWLs on tobacco products have been effective in changing social norms and reducing consumption, including among youth [29]. Cannabis users may benefit from HWLs given that the most recently available evidence suggests that many cannabis users have low awareness of health effects and obtain their limited health information about cannabis from unreliable sources [30–33]. To date, however, there is no empirical evidence on the impact of HWLs on cannabis products.

In October 2018, non-medical cannabis was legalised in Canada. The federal *Cannabis Act* establishes several international precedents for restrictions on advertising and promotion, packaging and labelling of cannabis products [34]. In particular, the *Act* prohibits any form of lifestyle advertising or promotion that appeals to young people, including restrictions on brand imagery of cannabis packaging, often referred to as 'plain' or standardised packaging [35]. Cannabis products will also be required to feature one of six large HWLs. The purpose of this study was to examine the effect of different types of branding elements, descriptors and HWLs on product perceptions among youth and young adults, including perceptions of standardised and branded packaging designs, perceptions of packs with and without HWLs, and perceptions of packs displaying brand imagery and leading descriptors on measures of appeal, perceived target age of consumer and other characteristics and lifestyle associations including gender, party habits, health consciousness and fashion sensibility. Our primary hypothesis was that individuals exposed to packs with branding elements, descriptors and without HWLs would report greater appeal scores when compared to those exposed to packs without these branding strategies and those bearing an HWL given existing findings from the tobacco control literature [19–22].

Methods

Design

An online cross-sectional survey was conducted from 10 to 24 October 2017. The inclusion criteria were individuals aged 16–30 years of age with a Canadian IP address, and included cannabis users and non-users. Recruitment occurred by e-mail through Léger's consumer panel for web surveys consisting of approximately 400 000 active members, half of them sampled using probability-based methods using the Canadian Census, along with other non-probability-based methods, including commercial surveys [36]. Respondents aged 16–30 years were recruited across Canada, with youth aged 16–18 years recruited through their parents. Respondents received remuneration from Léger in accordance with their usual incentive structure. All of the data provided by respondents were anonymous and kept strictly confidential. All respondents were provided with information about the study and asked to provide consent before participating. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392).

The current study consisted of a series of eight between-group experiments. Participants were randomised into experimental conditions before each of the eight consecutive experiments to examine distinct package elements in the following order: (i) 'plain' package and health warnings; (ii) a flavour descriptor; (iii) an 'energy' descriptor; (iv) a celebrity sponsorship; (v) music references; (vi) party references; (vii) health claims; and (viii) fashion references in which they viewed different cannabis packages. Participants rated each pack on three dimensions: (i) appeal; (ii) the perceived target age of the consumer; and (iii) a pack-specific question on the design element of interest, such as perceived gender, party habits, health perceptions or fashion, as shown in Tables 2 to 4.

Measures

Sociodemographic characteristics included sex, age, race and cannabis use status (drawn from the

Canadian Student Tobacco, Alcohol and Drugs Survey) [37].

Product appeal was rated using a 10-point scale from 0 = 'Not at all' to 10 = 'Very'. Perceived target age was assessed with, 'In your opinion, someone who chooses to use this product is more likely to be...', 'Younger than me', 'My age', 'Older than me'. A binary variable was created so that 1 = 'Younger than me' and 0 = 'Not younger than me'. Perceived sex was assessed with, 'In your opinion, someone who chooses to use this product is more likely to be...', 'Male', 'Female', 'No difference'. A binary variable was created so that 1 = 'Likely female' and 0 = 'Not likely female'. Party habits were assessed with, 'In your opinion, someone who chooses to use this product is more likely to...', 'Go out and party', 'Stay home', 'No difference'. A binary variable was created where 1 = 'Go out and party' and 0 = 'Not go out and party'. Health consciousness was assessed with, 'In your opinion, someone who chooses to use this product is more likely to be...', 'Someone who takes more care of their health', 'Someone who takes less care of their health', 'No difference'. A binary variable was created where 1 = 'Someone who takes more care of their health' and 0 = 'Not someone who takes more care of their health'. Fashion sense was assessed with, 'In your opinion, someone who chooses to use this product is more likely to be...', 'More fashionable', 'Less fashionable', 'No difference'. A binary variable was created where 1 = 'More fashionable' and 0 = 'Not more fashionable'.

Two data integrity questions were included in the survey, 'What is the current month?' as well as, 'did you feel you were able to provide 'honest' answers about your marijuana use during the survey?'. Respondents who did not provide accurate answers for 'current month' or reported not being able to answer

honestly were excluded. The full survey document is available at: http://davidhammond.ca/wp-content/uploads/2018/07/2017-Cannabis-Purchasing-Consumption-Tool-Survey-Document.pdf [38].

Analysis

All analyses were conducted using SPSS Statistical Software (Version 25.0, Armonk, NY: IBM Corp.). χ^2-tests and analysis of variance models were used to examine differences in the experimental outcomes for categorical and continuous measures, respectively. Linear regression models were fitted to examine correlates of continuous measures adjusting for age, sex, race and cannabis use status. Logistic regression models examined correlates of target consumer attributes including perceived target age, likely sex, party habits, relative health consciousness and fashion sense. Two-way interactions were tested between experimental conditions and sociodemographic factors and are presented in the text as appropriate. Additional multinomial analyses were undertaken to examine if patterns of results differed when the full range of responses for the dichotomous outcomes were used rather than collapsing the variable. In each case, when the test was significant with the binary outcome, it was also significant using the full response levels.

Results

Sample characteristics

Table 1 displays the sample characteristics. A total of 1045 respondents completed the survey; however, the final analytic sample was 870 as the rest were excluded from analysis due to missing data on key measures including cannabis use status and/or failed data integrity questions. Sample sizes of approximately 450 per between-group experiment provided statistical power to detect approximately an 8% difference in dichotomous outcomes. Experiment 1 was only completed by 526 respondents due to a programming error wherein respondents were not shown all possible conditions. Léger re-contacted all original respondents, and 526 respondents completed the experiment as intended.

Brand imagery, plain packaging and health warnings

Table 2 displays respondents' mean appeal scores and perceived consumer attributes for the packs displayed in the first experiment. The influence of product

Table 1. *Sample characteristics* (n = 870)

	n (%)
Sex	
Female	453 (52.1)
Male	417 (47.9)
Age, years	
16–18	219 (25.2)
19–24	267 (30.7)
25–30	384 (44.1)
Ethnicity	
White	561 (64.5)
Non-white	309 (35.5)
Cannabis use status	
Never use	361 (41.5)
Ever use, not in past 30 days	313 (36.0)
Current use, within past 30 days	196 (22.5)

Table 2. *Perceptions of brand imagery and health warnings among Canadian youth and young adults aged 16–30 years; experimental task 1 (*n = 526*); experimental task 2 (*n = 870*)*

	Experiment 1: Plain packaging and health warning labels				Experiment 2: Flavour reference	
	Condition 1: Plain pack displaying HWL	Condition 2: Plain pack, no HWL	Condition 3: Branded pack displaying HWL	Condition 4: Branded pack, no HWL	Condition 1: Flavour descriptor	Condition 2: No flavour descriptor
n	129	131	134	132	421	449
Mean appeal (SD)	4.04 (2.94)	4.93 (2.98)	4.82 (2.92)	5.13 (3.20)	6.39 (2.71)	6.00 (3.00)
Mean appeal score among males	4.85 (3.05)	5.84 (3.07)	5.13 (2.87)	4.30 (2.78)	6.07 (2.72)	6.26 (2.94)
Mean appeal score among females	3.32 (2.66)	4.03 (2.63)	4.59 (2.95)	5.61 (3.35)	6.66 (2.67)	5.77 (3.06)
Consumer is more likely to be, n (%)						
Younger than me	23 (17.8)	23 (17.6)	16 (11.9)	15 (11.4)	111 (26.4)	117 (26.1)
My age	33 (25.6)	41 (31.3)	44 (32.8)	44 (33.3)	204 (48.5)	202 (45.0)
Older than me	52 (40.3)	32 (24.4)	42 (31.3)	37 (28.0)	34 (8.1)	45 (10.0)
Do not know	21 (16.3)	35 (26.7)	31 (23.1)	35 (26.5)	70 (16.6)	83 (18.5)
More likely to be, n (%):						
Male	44 (34.1)	30 (22.9)	41 (30.6)	33 (25.0)	19 (4.5)	75 (16.7)
Female	16 (12.4)	23 (17.6)	18 (13.4)	13 (9.8)	183 (43.5)	68 (15.1)
No difference	58 (45.0)	61 (46.6)	66 (49.3)	69 (52.3)	194 (46.1)	273 (60.8)
Do not know	11 (8.5)	17 (13.0)	8 (6.0)	16 (12.1)	24 (5.7)	31 (6.9)

HWL, health warning labels.

branding (present or absent) and HWLs (present or absent) on ratings of appeal of cannabis products was examined, and main effects of HWLs (F [1,493] = 6.694, P = 0.010) and branding (F [1,493] = 4.542, P = 0.034) were detected on ratings of appeal of cannabis products. Packs that did not display a HWL (M = 5.03 SD = 3.09) received greater appeal scores on average, than packs that displayed a HWL (M = 4.44, SD = 2.95), (MD = 0.593, *t* [502] = 2.21, 95% confidence interval [CI] 0.07, 1.12, P = 0.028). Differences in means were not detected between branded (M = 4.98, SD = 3.06) and unbranded packs (M = 4.48, SD = 2.99) (MD = -0.497, *t*[502] = −1.845, 95% CI -1.21, 0.03, P = 0.066)). No interaction between the presence or absence of HWLs and branding was observed (F[1,493] = 0.659, P = 0.417).

Table S1 displays analyses of appeal, and perceptions of consumer attributes including target age and sex for the first experiment. Respondents were more likely to rate the plain/standardisd pack with an HWL as significantly less appealing (*b* = −0.653, SE = 0.254, P = 0.010) than the plain pack bearing an HWL. Similarly, the branded packs were rated as significantly more appealing than the plain packs (*b* = 0.567, SE = 0.256, P = 0.027).

A main effect of experimental condition on the perceived age of the target consumer was found (X^2[3, 523] =16.970, P = 0.002). Differences were detected between conditions where branding and HWLs were present and absent (X^2(1, 523) = 10.311, P = 0.001 and X^2(1, 523) = 5.449, P = 0.003) and between plain packs with and without HWLs X^2(1, 259) = 8.368, P = 0.004). When branding was present, respondents

were less likely to perceive the target consumer to be younger than when the product was not branded (AOR 0.56, 95% CI 0.34, 0.93, $P = 0.026$).

Lifestyle brand imagery

Table 2 shows pack ratings for the experiment examining the presence of flavour descriptors. A main effect was detected between the presence of a flavour descriptor and ratings of appeal ($F[1,824] = 7.138$, $P = 0.001$), ratings were higher when one was present (M = 6.39 SD = 2.71) than when one was not (M = 6.00 SD = 3.00). As displayed in Table S2, respondents were more likely to indicate greater appeal when a flavour descriptor was present ($b = 0.469$, SE = 0.187, $P = 0.012$) and that the target consumer was likely female than when absent (AOR 4.47, 95% CI 3.22, 6.21, $P < 0.001$). Respondents who had ever used cannabis were more likely to report greater appeal scores when a flavour descriptor was displayed on the pack ($P < 0.001$).

Table 3 shows pack ratings for the four experiments examining energy descriptors, celebrity references, music references and party references. Table S3 shows that, as expected, packs that displayed music or party references were more likely to be rated higher on appeal ($b = 0.619$, SE = 0.189, $P = 0.001$; $b = 0.936$, 0.187 $P < 0.001$, respectively). This was not the case for packs that displayed celebrity references. The cannabis pack that was manipulated to include an energy descriptor produced a contrary finding as it received a significantly lower mean appeal rating than when an energy claim was absent ($b = -0.587$, SE = 0.186, $P = 0.002$). Males reported greater ratings of mean appeal than females for packs that included music or party references. Across experiments displayed in Table 3, respondents that reported past or current cannabis use were more likely to report greater appeal scores than never users ($P < 0.001$).

When celebrity sponsorships (AOR 3.06, 95% CI 2.16, 4.36, $P < 0.001$), music references (AOR 3.64, 95% CI 2.37, 5.60, $P < 0.001$) or party references (AOR 12.29, 95% CI 8.08, 18.69, $P < 0.001$) were displayed on packs, respondents were more likely to rate them as being intended for a relatively younger consumer. The cannabis packs that included energy descriptors (AOR 3.17, 95% CI 2.30, 4.38, $P < 0.001$), celebrity sponsorships (AOR 3.60, 95% CI 2.70, 4.80, $P < 0.001$), music references (AOR 3.99, 95% CI 2.80, 5.70, $P < 0.001$) or party references (AOR 30.82, 95% CI 20.42, 46.50, $P < 0.001$) were more likely to be rated as being targeted at consumers that were perceived to 'like to party'.

Table 4 displays ratings of appeal and perceived consumer attributes for a cannabis product bearing fashion descriptors. Table S4 shows that past or current cannabis users were more likely to report greater appeal scores than those that reported never having used ($P < 0.001$). The target consumer of the pack that displayed a fashion descriptor was perceived as someone who was more likely to be female (AOR 8.22, 95% CI 5.63, 12.01, $P < 0.001$).

'Organic/natural' brand imagery

Table 4 displays ratings for cannabis packs with and without natural/organic descriptors. As shown in Table S5, past and current cannabis users were more likely to report greater appeal score when 'natural/organic' descriptors were present ($P < 0.001$). However, these descriptors were not associated with ratings of appeal or perceptions of the target consumer's perceived age. As expected, the intended consumer of the pack that displayed a natural/organic descriptor was perceived as someone who was more likely to be health conscious (AOR 2.63, 95% CI 1.94, 3.56, $P < 0.001$).

Discussion

The findings demonstrate that brand imagery on cannabis packaging can promote lifestyle associations and increase the appeal of cannabis products among young people. Consistent with previous research on tobacco products [39–42], plain/standardised cannabis packs with a health warning were perceived as the least appealing. As expected, differences in the appeal were greater among female participants for those experiments that featured female-oriented brand imagery in the form of pink packages with a floral design. Accordingly, females perceived the branded packs as significantly more appealing than the plain packages, relative to males. This is consistent with the finding that both males and females overwhelmingly perceived the target consumer to be males when the brand imagery was displayed; whereas only 3% of participants identified the plain packaging as overtly male. These findings are consistent with studies on tobacco products, in which plain packaging reduces the effectiveness of influencing product perceptions of specific subgroups through branding. The findings also suggest that health warnings and plain packaging may have independent effects and work in a complementary fashion: in other words, plain packaging may reduce the appeal of products beyond the effect of health warnings alone as observed among tobacco products although further study is

Table 3. *Perceptions of lifestyle brand references among Canadian youth aged 16–30 years; experimental tasks 3 to 6 (*n = 870*)*

	Experiment 3: Energy reference		Experiment 4: Celebrity reference		Experiment 5: Music reference		Experiment 6: Party reference	
	Condition 1: Energy descriptor	Condition 2: No energy descriptor	Condition 1: Celebrity sponsor	Condition 2: No celebrity sponsor	Condition 1: Music references	Condition 2: No music references	Condition 1: Party references	Condition 2: No party references
n	453	417	438	432	425	445	413	457
Mean appeal (SD)	5.08 (2.75)	5.62 (2.78)	5.99 (3.13)	5.73 (2.81)	5.95 (3.06)	5.36 (2.76)	5.63 (2.85)	4.72 (2.75)
Males	5.01 (2.84)	5.94 (2.81)	5.92 (3.24)	5.79 (2.82)	6.54 (3.05)	5.10 (2.76)	5.86 (2.96)	4.80 (2.87)
Females	5.14 (2.67)	5.34 (2.73)	6.06 (3.03)	5.67 (2.81)	5.39 (2.98)	5.59 (2.74)	5.43 (2.74)	4.65 (2.63)
Consumer is more likely to be, n (%)								
Younger than me	43 (9.5)	46 (11.0)	137 (31.3)	64 (14.8)	94 (22.1)	34 (7.6)	186 (45.0)	37 (8.1)
My age	122 (26.9)	157 (37.6)	196 (44.7)	178 (41.2)	153 (36.0)	122 (27.4)	133 (32.2)	130 (28.4)
Older than me	170 (37.5)	116 (27.8)	34 (7.8)	78 (18.1)	84 (19.8)	180 (40.4)	29 (7.0)	145 (31.7)
Do not know	116 (25.6)	93 (22.3)	69 (15.8)	110 (25.5)	91 (21.4)	104 (23.4)	63 (15.3)	140 (30.6)
More likely to, n (%)								
Go out and party	175 (38.6)	70 (16.8)	247 (56.4)	115 (26.6)	146 (34.4)	53 (11.9)	293 (70.9)	34 (7.4)
Stay home	76 (16.8)	86 (20.6)	27 (6.2)	81 (18.8)	84 (19.8)	121 (27.2)	15 (3.6)	108 (23.6)
No difference	142 (31.3)	204 (48.9)	124 (28.3)	178 (41.2)	146 (34.4)	210 (47.2)	69 (16.7)	242 (53.0)
Do not know	58 (12.8)	54 (12.9)	38 (8.7)	56 (13.0)	46 (10.8)	56 (12.6)	34 (8.2)	68 (14.9)

required to conclusively determine this for cannabis products [43]. The presence of HWLs decreased the likelihood of young Canadians finding a cannabis product appealing. Health warnings can reduce the appeal of consumer products both by highlighting negative health effects and by displacing promotional branding that can enhance appeal.

The addition of fruit or candy flavours has previously been shown to increase the appeal of tobacco and alcohol products among young people, and among females in particular [44–47]. In the current study, females perceived a peach-flavoured product as more appealing than male respondents. This is notable given the proliferation of cannabis edibles with similar fruit and candy flavours in legal markets.

The findings also demonstrate the variety of lifestyle associations that can be communicated through brand imagery on cannabis packaging. Robust associations were observed for female-oriented brand imagery, such as packs that displayed names such as 'Vogue'. Previous work has demonstrated that products with typically feminine brand imagery have greater appeal to female consumers [48,49]. In the present study, lifestyle imagery on packs was observed to affect consumer perceptions in each of the conducted experiments.

Previous research has shown that exposure to images of celebrities promotes associations between the product and the positive traits and lifestyle associated with the celebrity, which helps to normalise the product or behaviour [50]. The present study did not find

Table 4. *Perceptions of fashion related references and organic/natural descriptors among Canadian youth and young adults aged 16–30 years; experimental task 7 (*n = 870); experimental task 8 (*n = 870)

	Experiment 7: Fashion reference			Experiment 8: Organic/natural descriptor	
	Condition 1: Fashion reference	Condition 2: No fashion reference		Condition 1: Organic/natural descriptor	Condition 2: No organic/natural descriptor
n	454	416	*n*	447	191
Mean appeal (SD)	5.42 (2.96)	5.48 (2.82)	*Mean appeal (SD)*	5.97 (2.79)	6.18 (2.97)
Males	5.21 (2.92)	5.51 (2.94)	Males	6.06 (2.81)	6.22 (2.98)
Females	5.62 (2.99)	5.47 (2.72)	Females	5.88 (2.76)	6.15 (2.96)
Consumer is more likely to be, n (%)			*Consumer is more likely to be, n (%)*		
Male	32 (7.0)	127 (30.5)	Younger than me	29 (6.5)	32 (7.6)
Female	207 (45.6)	42 (10.1)	My age	156 (34.9)	134 (31.7)
No difference	172 (37.9)	213 (51.2)	Older than me	160 (35.8)	163 (38.5)
Do not know	39 (8.6)	33 (7.9)	Do not know	99 (22.1)	90 (21.3)
More likely to be, n (%)			*More likely to be, n (%):*		
More fashionable	233 (51.3)	200 (48.1)	Someone who takes more care of their health	189 (42.3)	92 (21.7)
Less fashionable	24 (5.3)	30 (7.2)	Someone who takes less care of their health	50 (11.2)	54 (12.8)
No difference	145 (31.9)	154 (37.0)	No difference	166 (37.1)	217 (51.3)
Do not know	47 (10.4)	31 (7.5)	Do not know	40 (8.9)	56 (13.2)

significant differences in mean appeal ratings for cannabis packs that featured celebrity sponsorship, although the products were perceived to be targeting younger consumer who like to party. In addition, the product displaying an image of Bob Marley was perceived as significantly more appealing and intended for younger consumers who 'like to party'.

When interpreting the findings on lifestyle associations, it is important to highlight that that the sex of brand stimuli was not balanced in many of the experimental conditions. For example, the 'music' branding included a female performer (Beyoncé), while the fashion manipulation used female-oriented branding (Vogue). Although these contrasts were designed to test the principle of whether pack branding could influence consumer perceptions, the greater emphasis on female-oriented branding should be considered when

interpreting the findings. Future research should examine a broader scope of both male and female-oriented imagery to examine potential differences in sex effects, as well as other characteristics, such as racial profile.

References such as 'natural' and 'organic' are among the most common health-oriented descriptors for consumable tobacco products, and have been shown to increase the appeal of food and tobacco products [19,51–53]. In the present study, products labelled as organic/natural were perceived as 'less harmful'

Strengths and limitations

The sample was recruited from a commercial sample; thus, the sample may not be fully representative of Canadian youth. Nevertheless, a broad and diverse

sample with similar patterns of cannabis use and sociodemographic characteristics as recent nationally representative youth surveys was recruited. For example, according to the 2017 Canadian Cannabis Survey, up to 48% of Canadians aged 16–24 years reported cannabis use in the past year and in the current study, 45% reported the same [54]. The present sample included 16–30-year-old individuals; while this age group has the highest rates of cannabis use in Canada, the extent to which the current findings generalise to older adults is unclear given that marketing can have a greater impact among young people [4]. Notably, race was presented as binary variable as its disaggregation into the list of categories used by national surveys and the census would have provided groups with small cell sizes too small to make meaningful inferences. A considerable strength of the study was the between-group experimental design for testing packaging and brand imagery. The use of actual product images is also a strength, although the effects of brand imagery may be underestimated in an online environment compared to the experience of seeing or handling 'real' packs. Furthermore, images may not neatly align with the isolated branding elements such as the packs bearing a celebrity sponsorship and music references, wherein there may be some overlap. For example, although the branding featuring Bob Marley was included in the 'music' category, it could be equally considered to be a 'celebrity' reference, while the reverse is also true for the Beyoncé branding. Therefore, the branding elements tested in the present study should be considered as exemplars to test the potential effects of branding, rather than a set of distinct branding themes or categories. Presentation-order and demand effects may be present, in which the images viewed in earlier experiments may have affected responses to subsequent experiments. However, participants were randomised to each experiment separately; therefore, any potential presentation-order effects would have been adjusted for in the between-group contrasts. Finally, after randomisation for systematic differences between groups and inclusion of data quality items in the study, response and sampling bias may have persisted in the present study.

Conclusions

The study provides experimental evidence that branding on cannabis packaging can promote lifestyle associations and appeal to youth. The findings are consistent with evidence from tobacco and alcohol research on the importance of packaging and brand imagery to consumer behaviour and suggest the same principles may apply to cannabis products [10–12]. The findings support the

efficacy of marketing restrictions included in Canada's *Cannabis Act*, which limit branding on packaging and marketing that appeals to young people [55].

Conflicts of Interest

The authors have no conflicts of interest.

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Supporting Information

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

Table S1. Linear and logistic regressions examining appeal and perceptions of consumer attributes of plain and branded cannabis pack variations and health warning labels among Canadian youth and young adults aged 16–30 years ($n = 501$).

Table S2. Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs with flavour descriptors among Canadian youth and young adults aged 16–30 years ($n = 830$).

Table S3. Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing lifestyle brand references among Canadian youth and young adults aged 16–30 years.

Table S4 Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing fashion references among Canadian youth and young adults aged 16–30 years ($n = 829$).

Table S5 Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing organic/natural references among Canadian youth and young adults aged 16–30 years ($n = 833$).