



## An experimental study on perceptions of energy drink ads among youth and young adults in Canada

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### ABSTRACT

Current regulations in Canada prohibit the marketing of caffeinated energy drinks (CEDs) for use during sports, with alcohol, and by children. The study examined perceptions of CED ads in association with sports and alcohol use, as well as target age groups. An online survey was conducted in 2015 with youth and young adults aged 12–24 years (n = 2010). Participants completed three experiments in which they were randomized to view CED advertisements: 1) sports/party-themed ads, 2) sports-themed ad, and 3) party-themed ad, vs. control ‘product information’ ads. For each ad, participants were asked about perceived target age group, and if the ad promoted using CEDs during sports and with alcohol. Logistic regression models were fitted to test differences in outcomes between conditions. The majority of respondents reported that the ads, across all themes, targeted people their age. In experiment 1, both sports/party-themed ads were more likely to be perceived as promoting use of CEDs during sports (AOR = 13.32; 95% CI 9.90, 17.91, and AOR = 9.73; 95% CI 7.38, 12.81, respectively), and with alcohol (AOR = 8.55; 95% CI 6.37, 11.48, and AOR = 2.81; 95% CI 2.08, 3.78, respectively), compared to the control ad. In experiment 2, the sports-themed ad was more likely to be perceived as promoting use of CEDs during sports (AOR = 15.02; 95% CI 11.83, 19.08), but not with alcohol, compared to the control ad. In experiment 3, the party-themed ad was more likely to be perceived as promoting use of CEDs with alcohol (AOR = 13.79; 95% CI 10.69, 17.78), but not during sports, compared to the control ad. Ads from leading energy drink brands are perceived as targeting young people and encouraging energy drink use during sports and with alcohol, despite Canadian regulations prohibiting these marketing practices.

### 1. Introduction

Consumption of caffeinated energy drinks (CEDs) has increased dramatically over the past decade, particularly among young people (Yale Rudd Center for Food Policy and Obesity, 2014). In Canada, almost three-quarters of young people have tried CEDs at least once in their lifetime (Reid et al., 2017). Concerns have been raised about potential adverse health effects and risks associated with consuming CEDs, particularly among young people (Al-Shaar et al., 2017; Breda et al., 2014; De Sanctis et al., 2017; Pound & Blair, 2017; Seifert, Schaechter, Hershorin, & Lipshultz, 2011). While moderate consumption of caffeine alone is associated with minimal risks, previous related research has shown that CEDs appear to pose greater risks (Hammond, Reid, & Zukowski, 2018). For example, over half of youth and young adults in Canada who had ever used CEDs reported experiencing an adverse event from their consumption, including fast heartbeat, difficulty sleeping, headaches, nausea/

vomiting/diarrhea, and seizures (Hammond et al., 2018). American data indicate that the number of emergency room visits related to CEDs doubled from 2007 to 2011 (Mattson, 2013).

The risks associated with CED consumption may be due to the context in which these products are commonly consumed, including during physical activity. CED consumption is more common among athletes, who often consume CEDs shortly before, during, or after sports or physical activity (Ballistreri & Corradi-Webster, 2008; Nowak and Jasionowski, 2015, 2016; Zucconi et al., 2013). Consuming CEDs during physical activity is not recommended, especially by children and adolescents, as it can cause a variety of adverse health effects, including restlessness and irritability, an increase in blood pressure, a reduction in insulin sensitivity, and dehydration (Health Canada, 2013; Higgins, Tuttle, & Higgins, 2010; Lee, Hudson, Kilpatrick, Graham, & Ross, 2005; Rodriguez, DiMarco, & Langley, 2009; Schneider & Benjamin, 2011). In fact, case studies have associated excess CED consumption

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before physical activity with cardiac arrest and even death (Avci, Sarikaya, & Büyükcamlar, 2013; Berger & Alford, 2009).

Alcohol consumption also increases the risks of CED consumption. Consuming alcohol mixed with energy drinks is a common practice among young people, especially secondary and post-secondary aged students (Azagba, Langille, & Asbridge, 2013; Martz, Patrick, & Schulenberg, 2015; O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008; Patrick, Veliz, Linden-Carmichael, & Terry-McElrath, 2018; Reid, Hammond, McCrory, Dubin, & Leatherdale, 2015; Wilson et al., 2018; Zucconi et al., 2013). Mixing alcohol and energy drinks can reduce feelings of impairment and mask drowsiness associated with alcohol intake, which may increase the risk of dehydration, overconsumption of alcohol, and alcohol-related injury (Health Canada, 2012). In addition, the consumption of alcohol with energy drinks is associated with an increased likelihood of risky behaviours, including driving while intoxicated or with an intoxicated driver, as well as being hurt or injured (Brache & Stockwell, 2011; Roemer & Stockwell, 2017). Following the recent death of a 14-year-old girl who had consumed an alcoholic beverage containing natural caffeine, Health Canada issued a reminder about safe levels of alcohol consumption, as well as advice not to mix alcohol with energy drinks (Health Canada, 2018). While current regulations prohibit adding caffeine to alcoholic beverages, a 'loophole' exists in which flavouring agents, including natural sources of caffeine such as guarana or coffee, may be added to alcoholic beverages (Young, 2018).

In 2012, Health Canada implemented a new regulatory framework for CEDs in Canada (Health Canada, 2013). As part of the Temporary Marketing Authorization granted to CEDs, Health Canada does not recommend using CEDs for sport performance or mixing CEDs with alcohol (Health Canada, 2013). Cautionary statements required on products include "Not recommended for children ..." and "Do not mix with alcohol" (Health Canada, 2013). Alongside cautionary statements, CEDs must also comply with regulations surrounding advertising and claims. Under the Food and Drugs Act, the term 'advertisement' includes product representation by any means whatsoever that promotes the sale of the product, directly or indirectly (Health Canada, 2013). Any information that is not allowed on labels is also not allowed in advertising. Therefore, as per the cautionary statement on the product, CEDs should not be promoted to children, and should not be promoted for use with alcohol. Although not included as a cautionary statement on the product, health claims (implicit or explicit) promoting use of CEDs for physical performance (including physical exertion, endurance, aerobic, anaerobic, power, strength, motor performance, recovery, or sports) are prohibited (Health Canada, 2013).

CED manufacturers have stated that they do not market their products to children or associate their products with alcohol (Canadian Beverage Association, n.d.). However, analyses of the content of CED ads suggest that CED marketing typically targets younger audiences and males, and marketing often features athletes, sports, and popular entertainment (Red Bull, n.d.; Yale Rudd Center for Food Policy and Obesity, 2014). Marketing impacts choices and behaviours, as shown in other domains, such as food marketing (Heart and Stroke Foundation, 2017; Sadeghirad, Duhaney, Motaghipisheh, Campbell, & Johnston, 2016; Scully et al., 2012). Importantly, young people, particularly children, are vulnerable to marketing messages. While very young children do not understand the intent of ads, children around the age of 10–12 are typically able to recognize that the purpose of an ad is to sell a product, however, they are not always able to critically assess the ad (Heart and Stroke Foundation, 2017). Even teenagers are susceptible to marketing, as they are likely to believe industry tactics such as misleading claims (Heart and Stroke Foundation, 2017). There is little evidence on how young people perceive the content of CED ads, which represents the best indicator of the impact of advertising content on consumer perceptions. A qualitative study on perceptions and knowledge of CEDs among Canadian youth aged 12–18 found that respondents perceived CED marketing practices, such as the sponsorship

of extreme sports events, as targeting their age group (McCrory et al., 2017). Respondents also made associations with ads and mixing alcohol with energy drinks (McCrory et al., 2017). Other previous research has also shown that young people perceive CED ads as targeting a young demographic, as well as promoting the use of CEDs during sports (Hammond & Reid, 2017).

To date, there is little evidence on consumer perceptions of CED ads, apart from the two related studies mentioned previously (Hammond & Reid, 2017; McCrory et al., 2017). Previous related research experimentally tested perceptions of CED ads, focusing on target audience age and promotion of CED use during sports (Hammond & Reid, 2017). The current study sought to replicate and extend these results, by experimentally testing if CED ads are perceived as promoting CEDs for use during sports and with alcohol, as well as target age groups.

## 2. Methods

Data were collected via self-completed, online surveys, between November 6, 2015 and December 22, 2015.

### 2.1. Sample & recruitment

Respondents were recruited via email through the Légerweb consumer panel, which has over 400,000 active members, half of them sampled using probability-based methods (Leger, 2015). Respondents aged 18–24 were recruited directly. Respondents aged 12–17 were recruited through their parents and parental consent was obtained prior to youth accessing the survey. All respondents were provided with information about the study and asked to give consent before participating. The survey was available in English or French, and took approximately 20 minutes to complete. Respondents received remuneration from Léger in accordance with their usual incentive structure, which allows respondents to earn points or monetary rewards (redeemed as cash or donated), as well as chances to win monthly prizes.

A total of 2181 respondents completed the survey. Records were deleted due to missing data on variables used for weighting ( $n = 22$ ) and other variables of primary interest ( $n = 45$ ), completion outside of the study timeframe ( $n = 1$ ) or failing a data quality check question that asked for the current month ( $n = 103$ ). Thus, a total of 2078 were retained for analysis. Sample weights were constructed based on population estimates from the 2011 National Household Survey (NHS) (Statistics Canada, 2011). Sample probabilities were created for 40 demographic groups (age group by sex by region) based on weighted NHS proportions, and applied to the data set. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo. No personal identifiers were collected as part of the study.

### 2.2. Measures

#### 2.2.1. Sample characteristics

Respondents were asked about the following: sex, age (re-coded as 12–14, 15–17, 18–19, or 20–24), race/ethnicity [12 categories; re-coded as white (only), mixed/other/don't know/refused], or Aboriginal (any)], and province of residence (re-coded into region: British Columbia, Prairies, Ontario, Quebec, Atlantic). They were also asked if they had ever consumed energy drinks, and about their exposure to CED marketing channels (using a 'select all that apply' list of 10 sources of marketing exposure). A *Marketing Exposure Index* was created by summing the number of places each respondent reported seeing energy drink advertising (range 0–10), including: 1) ads on TV; 2) posters or signs in a convenience or grocery store; 3) ads online/on the internet; 4) as part of a social media site, like Facebook or Twitter; 5) promotion or sponsorship, such as logos or links with events, sports teams or athletes; 6) cars/vehicles with energy drink branding; 7) ads in magazines or

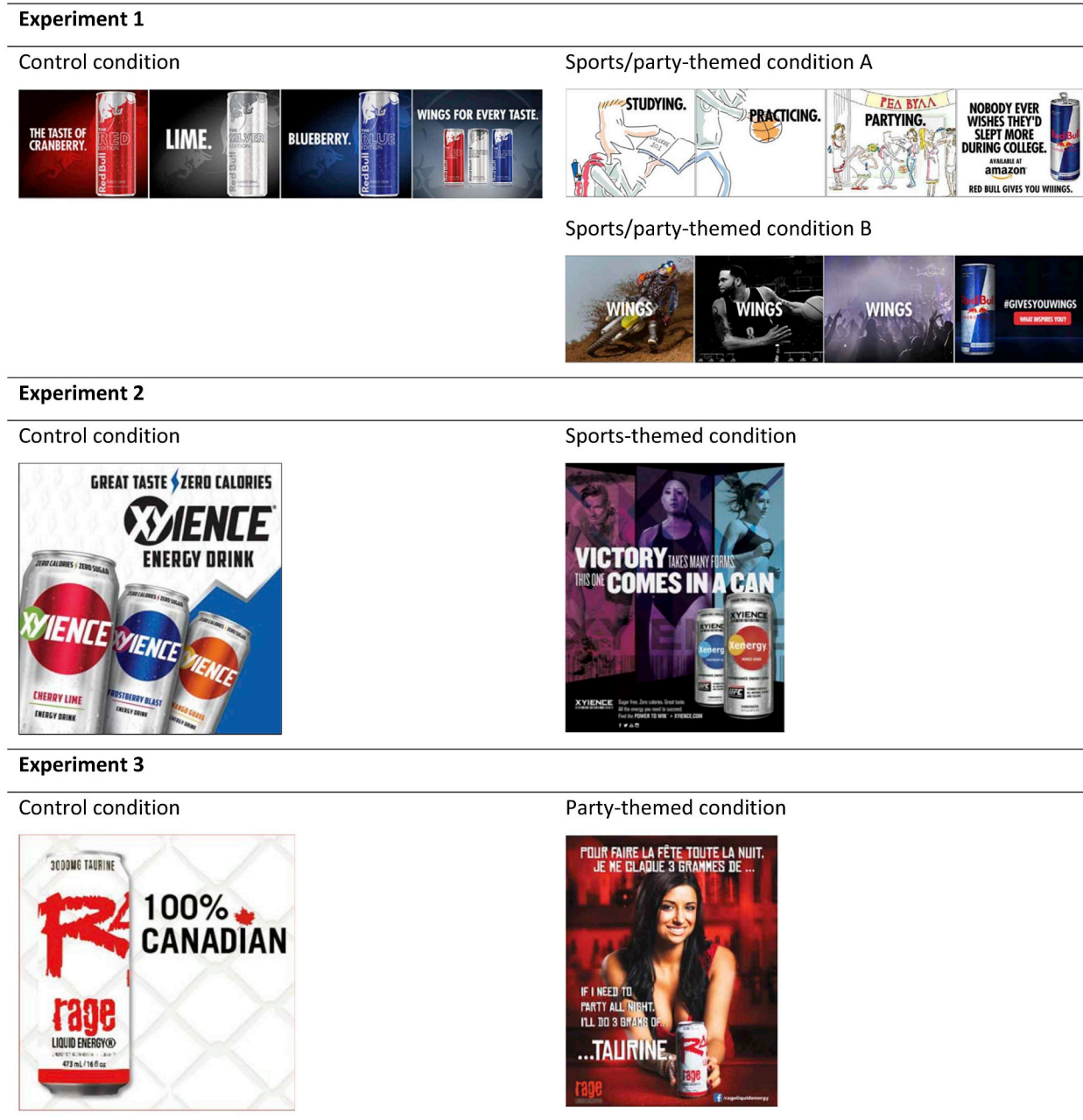


Fig. 1. Ads shown in each experiment.

newspapers; 8) free samples of energy drinks or shots; 9) giveaways of branded merchandise; and, 10) other.

2.2.2. Experiments

Respondents completed three experiments in which they were randomized to view different CED advertisements. Randomization was independent for each experiment. All ads shown in the experiments were real ads for energy drink brands, identified through an online search. The ads were selected purposefully by brand in order to have sports/party themes, as well as control ads with product information only. The first experiment included two sports/party-themed ads as well as a control ad featuring product information, while the second experiment included a sports-themed ad and control ad, and the third experiment included a party-themed ad and control ad (see Fig. 1). This set of experiments helped to verify consumer perceptions of ad content across different ads and brands.

In each experiment, respondents were asked three questions while

the ad was shown on screen: 1) ‘What age group does this ad target?’, with select all that apply response options of *People younger than me*, *People my age*, *People older than me*; 2) ‘Does this ad promote using these energy drinks during sports?’, *Yes* or *No*; and, 3) ‘Does this ad promote using these energy drinks with alcohol?’, *Yes* or *No*. Response options of *Don't know* and *Refuse to answer* were also provided for each question.

2.2.3. Analysis

Descriptive statistics were used to determine response prevalence for each outcome, by condition. To examine whether randomization was effective in balancing experimental conditions, Chi-square tests were conducted to test differences in sociodemographic characteristics (sex, age group, ever-use of CEDs, and exposure to energy drink marketing channels as determined by the *Marketing Exposure Index*) between conditions.

For each of the three experiments, separate logistic regression models were fitted to examine the effect of condition (i.e., ad) on each

**Table 1**  
Sample characteristics of respondents in analytic sample, unweighted and weighted (n = 2010).

Characteristic	Unweighted % (n)	Weighted % (95% CI)
Sex		
Male	50.4% (1013)	51.1% (49.0, 53.3)
Female	49.6% (997)	48.9% (46.7, 51.0)
Age group		
12-14	19.7% (396)	21.6% (19.8, 23.4)
15-17	30.4% (612)	23.8% (22.0, 25.7)
18-19	10.4% (209)	15.9% (14.3, 17.5)
20-24	39.5% (793)	38.7% (36.6, 40.9)
Language of survey		
English	60.3% (1212)	77.9% (76.0, 79.6)
French	39.7% (798)	22.1% (20.4, 24.0)
Race/ethnicity		
White (only)	73.8% (1484)	66.9% (64.8, 68.9)
Mixed/Other/Don't know/ Refused	23.1% (464)	29.3% (27.4, 31.4)
Any Aboriginal	3.1% (62)	3.8% (3.1, 4.7)
Region		
British Columbia	7.4% (148)	12.9% (11.4, 14.4)
Prairies (AB, SK, MB)	13.1% (264)	18.4% (16.7, 20.1)
Ontario	31.0% (623)	39.8% (37.7, 42.0)
Quebec	43.3% (870)	22.6% (20.9, 24.6)
Atlantic (NB, NL, NS, PEI)	5.2% (105)	6.3% (5.3, 7.4)
Ever-use of energy drinks		
Yes	74.3% (1493)	75.4% (73.5, 77.3)
No	25.7% (517)	24.6% (22.7, 26.5)
Marketing exposure index (mean; SD)	3.4; 2.9	3.4; 2.9

of the following three outcomes: 1) perceiving the ad targets 'people younger than me'; 2) perceiving the ad promotes using CEDs during sports; and, 3) perceiving the ad promotes using CEDs with alcohol. A hierarchical approach was used to test two-way interactions between the experimental condition and the other covariates: interactions were added to the main effects logistic regression model (including all covariates) one at a time. Any significant ( $p < 0.05$ ) two-way interactions were then combined in a final model, adjusting for the covariates. Weighted estimates are reported, unless otherwise specified. Analyses were conducted using IBM SPSS version 24 and SAS version 9.4.

### 3. Results

#### 3.1. Sample characteristics

Table 1 presents characteristics of the respondents in the analytic sample.

#### 3.2. Randomization

The tests revealed differences in ever-use of CEDs for experiments 2 ( $p = 0.03$ ) and 3 ( $p < 0.001$ ), and age group for experiment 3 ( $p = 0.04$ ); therefore, all models adjusted for sex, age group, ever-use of CEDs, and exposure to CED marketing channels.

#### 3.3. Experiment 1

The results from experiment 1 are presented in Fig. 2, and Supplementary Table 1. Among respondents aged 12–14 and 15–17, 29.3% and 59.1%, respectively, reported that sports/party-themed ad A targeted people their age or younger; 33.1% and 55.0%, respectively, reported that sports/party-themed ad B targeted people their age or younger. Overall, there were no significant differences across conditions in perceiving a younger target audience ( $p = 0.26$ ).

As shown in Fig. 2A, there were significant differences across conditions in perceiving the ad as promoting use of CEDs during sports ( $p < 0.001$ ): respondents were more likely to perceive the ad as

promoting use of CEDs during sports if they viewed sports/party-themed ad A (AOR = 13.32; 95% CI 9.90, 17.91) or B (AOR = 9.73; 95% CI = 7.38, 12.81), compared with the control ad. There were also significant interactions between condition and sex ( $p = 0.02$ ), and condition and exposure to energy drink marketing channels ( $p < 0.001$ ). Females were more likely than males to perceive that sports/party-themed ad B ( $\beta = 0.80$ ,  $p = 0.005$ ) promoted use of CEDs during sports relative to the control condition. Respondents who reported a greater number of channels of exposure to CED marketing were more likely to perceive that sports/party-themed ads A ( $\beta = 0.21$ ,  $p < 0.001$ ) and B ( $\beta = 0.11$ ,  $p = 0.02$ ) promoted use of CEDs during sports, relative to the control ad.

As shown in Fig. 2B, there were significant differences between conditions in perceiving the ad as promoting using CED with alcohol ( $p < 0.001$ ): respondents were more likely to perceive the ad as promoting using CEDs with alcohol if they viewed sports/party-themed ad A (AOR = 8.55; 95% CI 6.37, 11.48) or B (AOR = 2.81; 95% CI = 2.08, 3.78), compared to the control ad. There were also significant interactions between condition and sex ( $p = 0.03$ ), and condition and age group ( $p = 0.003$ ). Females were more likely than males to perceive sports/party-themed ad A as promoting use of CEDs with alcohol ( $\beta = 0.67$ ,  $p = 0.007$ ), relative to sports/party-themed ad B. Respondents aged 12–14 and 15–17 were more likely to perceive that sports/party-themed ad A promoted use of CEDs with alcohol compared to respondents aged 18–19 ( $\beta = 1.26$ ,  $p = 0.002$  and  $\beta = 1.01$ ,  $p = 0.01$ , respectively) and 20–24 ( $\beta = 1.05$ ,  $p = 0.002$  and  $\beta = 0.82$ ,  $p = 0.01$ , respectively), relative to sports/party-themed ad B. Respondents aged 20–24 were more likely to perceive that sports/party-themed ad B promoted use of CEDs with alcohol compared to respondents aged 12–14 ( $\beta = 0.98$ ,  $p = 0.02$ ) and 15–17 ( $\beta = 1.13$ ,  $p = 0.01$ ), relative to the control ad; this contrast was also significant for respondents aged 18–19 compared to respondents aged 15–17 ( $\beta = 1.00$ ,  $p = 0.04$ ).

#### 3.4. Experiment 2

The results from experiment 2 are presented in Fig. 3, and Supplementary Table 2. Among respondents aged 12–14 and 15–17, 26.9% and 42.4%, respectively, reported that the sports-themed ad targeted people their age or younger. Overall, there was a significant difference ( $p = 0.002$ ) between conditions in perceiving a younger target audience: respondents were more likely to perceive the ad as targeting people younger than them if they viewed the control ad compared to the sports-themed ad (AOR = 1.55, 95% CI 1.18, 2.03). There were no significant interactions between condition and the sociodemographic variables.

As shown in Fig. 3A, there was a significant difference between conditions in perceiving the ad as promoting use of CEDs during sports ( $p < 0.001$ ): respondents were more likely to perceive the ad as promoting use of CEDs during sports if they viewed the sports-themed ad (AOR = 15.02; 95% CI 11.83, 19.08) compared to the control ad. There were also significant interactions between condition and sex ( $p < 0.001$ ), condition and age group ( $p < 0.001$ ), and condition and exposure to energy drink marketing channels ( $p < 0.001$ ). Females were more likely than males to perceive the sports-themed ad as promoting use of CEDs during sports ( $\beta = 0.88$ ,  $p < 0.001$ ), relative to the control ad. Respondents aged 12–14 and 15–17 were more likely to perceive the sports-themed ad as promoting use of CEDs during sports compared to respondents aged 18–19 ( $\beta = 1.34$ ,  $p = 0.001$ , and  $\beta = 1.36$ ,  $p < 0.001$ , respectively) and 20–24 ( $\beta = 0.91$ ,  $p = 0.008$ , and  $\beta = 0.93$ ,  $p = 0.006$ , respectively), relative to the control ad. Respondents who reported a greater number of channels of exposure to CED marketing were more likely to perceive the sports-themed ad as promoting use of CEDs during sports ( $\beta = 0.16$ ,  $p < 0.001$ ), relative to the control ad.

As shown in Fig. 3B, there was no significant difference between



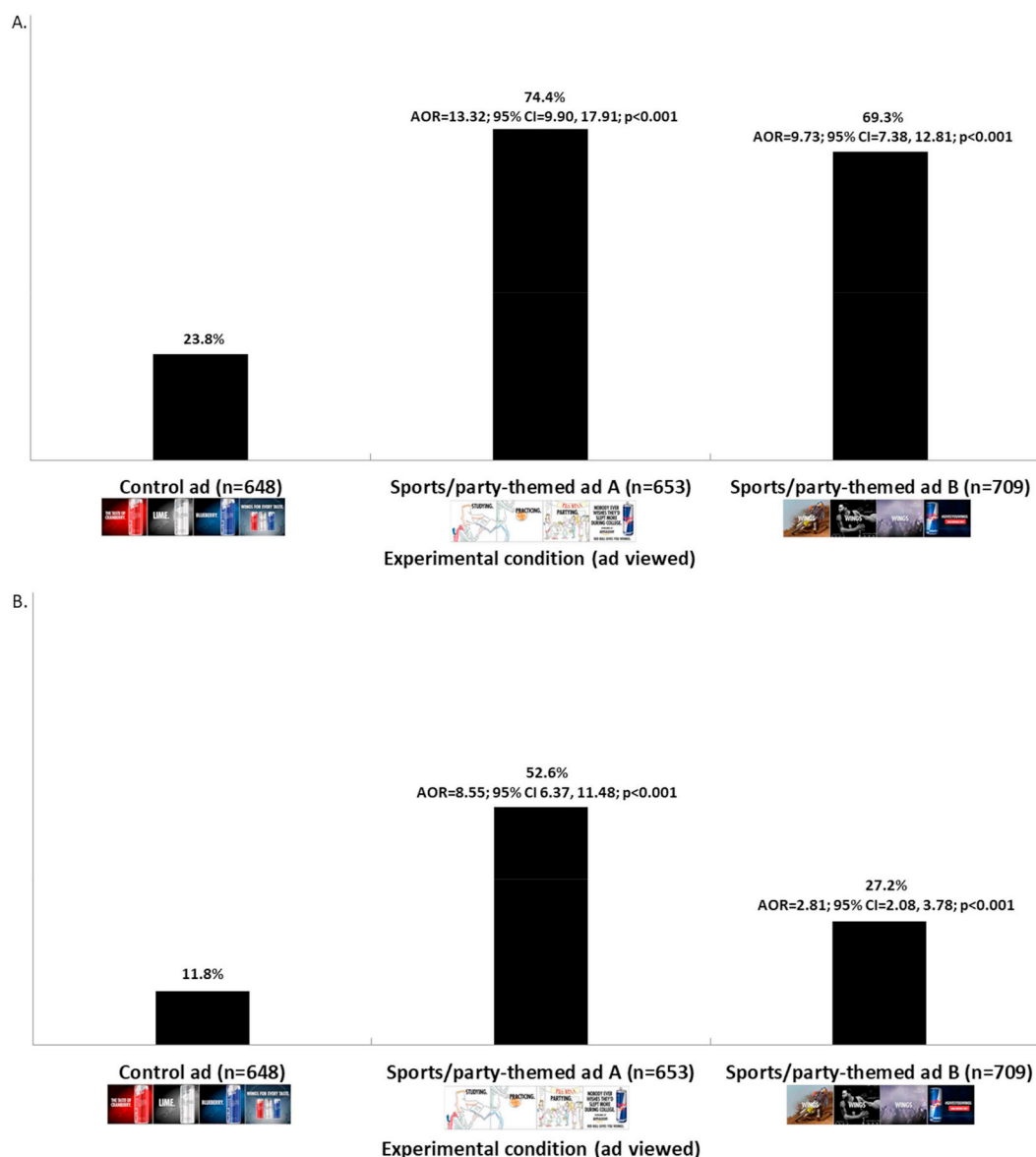


Fig. 2. Experiment 1

A. Proportion of respondents who reported that ad promoted use of energy drinks during sports, by condition (advertisement) (n = 2010).

B. Proportion of respondents who reported that ad promoted use of energy drinks with alcohol, by condition (advertisement) (n = 2010).

Note: ‘Don’t know’ and ‘Refused’ responses included in the denominator.

conditions in perceiving the ad as promoting use of CEDs with alcohol (p = 0.98).

### 3.5. Experiment 3

The results from experiment 3 are presented in Fig. 4, and Supplementary Table 3. Among respondents aged 12–14 and 15–17, 12.4% and 34.8%, respectively, reported that the party-themed ad targeted people their age or younger. Overall, there was no significant difference between conditions in perceiving a younger target audience (p = 0.09).

As shown in Fig. 4A, there was no significant difference between conditions in perceiving the ad as promoting use of CEDs during sports (p = 0.22).

As shown in Fig. 4B, there was a significant difference between conditions in perceiving the ad as promoting use of CEDs with alcohol (p < 0.001): respondents were more likely to perceive the ad as promoting use of CEDs with alcohol if they viewed the party-themed ad

(AOR = 13.79; 95% CI 10.69, 17.78), compared to the control ad. In addition, there was a significant interaction between condition and sex (p = 0.005): females were more likely than males to perceive the party-themed ad as promoting use of CEDs with alcohol (β = 0.73, p = 0.005), relative to the control condition.

## 4. Discussion

The current study indicates that youth and young adults perceive CED ads to be targeting people their age, with evidence that a substantial number of 12- to 14-year-old respondents perceived some ads to be targeting people their age or younger. This finding is consistent with previous related studies indicating that young people perceive CED ads as targeting a young demographic (Hammond & Reid, 2017; McCrory et al., 2017). It is evident that CED ads are perceived as targeting young people, despite regulations prohibiting marketing to children (Health Canada, 2013). While current regulations classify a child as 12 years and under, there is also debate as to what constitutes a

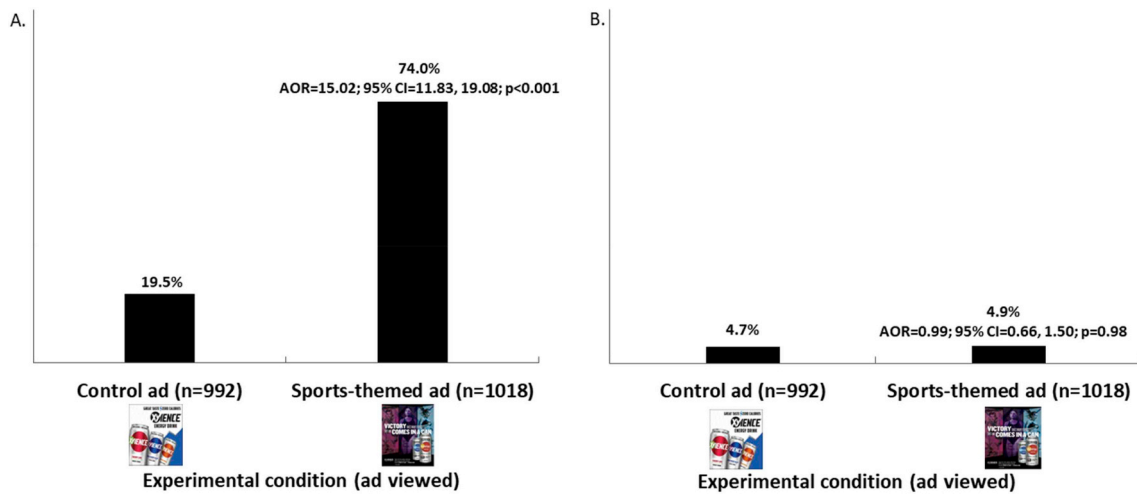


Fig. 3. Experiment 2

A. Proportion of respondents who reported that ad promoted use of energy drinks during sports, by condition (advertisement) (n = 2010).  
 B. Proportion of respondents who reported that ad promoted use of energy drinks with alcohol, by condition (advertisement) (n = 2,010).  
 Note: ‘Don’t know’ and ‘Refused’ responses included in the denominator.

‘child’. For example, consultations for Health Canada's proposed approach to restricting the marketing of unhealthy food and beverages to children found that many contributors supported the inclusion of those under 17 years in the definition of ‘child’ (Health Canada, 2017).

In addition, the current study clearly illustrates that youth and young adults perceive real CED ads to be promoting use of CEDs during sports and with alcohol, consistent with prior related studies (Hammond & Reid, 2017; McCrory et al., 2017). This finding was established in each of the three separate experiments. For example, across all experiments, the ads with sports themes were consistently perceived as promoting use of CEDs during sports, compared to the ads with only party themes or control ads. In general, females were more likely than males to perceive that the ads with sports themes promoted use of CEDs during sports. One possible explanation for this finding is that the sports-themed ad in one of the experiments predominantly featured females, which may have made it resonate more with female respondents. In addition, respondents who reported a greater number of channels of exposure to CED ads were more likely to perceive the sports-themed ad as promoting use of CEDs during sports relative to the

control ad, which may be due to greater awareness and sensitivity to the content of ads, possibly stemming from a more stable brand impression. It may also be that this relationship has to do with particular channels of exposure, such as sports sponsorship, which would contribute to the overall number of channels of exposure.

Similar to the findings for the sports-themed ads, ads featuring party themes were consistently perceived as promoting use of CEDs with alcohol, compared to ads with only sports themes or control ads. Overall, there were fewer interactions for ads with party themes. Though, similar to sports-themed ads, females were more likely to perceive the party-themed ads as promoting use of CEDs with alcohol. It may be that while females focused on the party themes of the ad and made connections to alcohol, males focused on other parts of the ads, including the multiple components (studying and practising) featured in the sports/party-themed ad A in experiment 1, and the bartender featured in the party-themed ad in experiment 3. It may also be possible that females were more involved and focused on the content in the survey; females have been shown to participate in online questionnaires more than males (Lefever, Dal, & Matthíasdóttir, 2006), as well as accept a

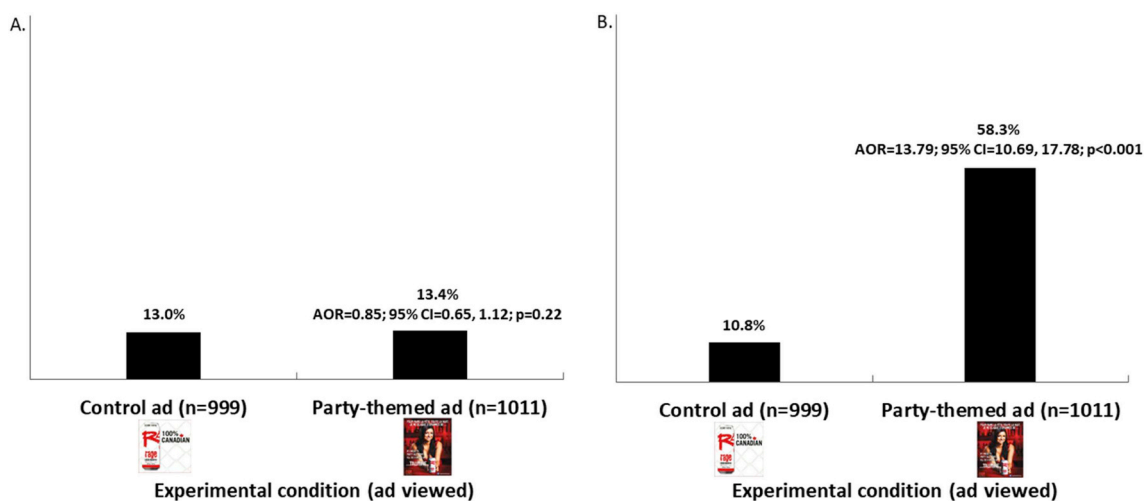


Fig. 4. Experiment 3

A. Proportion of respondents who reported that ad promoted use of energy drinks during sports, by condition (advertisement) (n = 2010).  
 B. Proportion of respondents who reported that ad promoted use of energy drinks with alcohol, by condition (advertisement) (n = 2010).  
 Note: ‘Don’t know’ and ‘Refused’ responses included in the denominator.

lesser incentive for their participation (Boulianne, 2013), which may extend to their willingness to perform well in the survey, including reading, focusing, and responding to questions. Future research, including qualitative studies, should explore sex differences in ad perceptions. While there were no consistent findings for age group, younger respondents were more likely to perceive the sports/party-themed ad with cartoon images as promoting use of CEDs with alcohol, which may have been due to the general appeal of the ad style to younger audiences.

The findings also show specificity of responses to ad messaging, helping to address any study demand effects, social desirability bias, or concerns related to participants responding to their previous knowledge of the brand. In experiment 2, where respondents viewed either a sports-themed ad or a control ad, perceptions of the ad promoting use of CEDs with alcohol were very low for both conditions. Likewise, in experiment 3, where respondents viewed a party-themed ad or a control ad, perceptions of ad messaging as promoting using CEDs during sports were similarly low.

Overall, the findings demonstrate that current regulations in Canada are not achieving their objectives. If the goal is to prevent consumption of CEDs by children, as well as use during sports and with alcohol, then greater compliance to the current regulations or additional marketing restrictions are necessary. Other policy measures, such as increasing the price of the product, changing product packaging, and restricting sales to children, may also be effective. For example, UK supermarkets have recently banned sales of energy drinks to children under 16 (Smithers, 2018). More generally, the findings highlight the importance of population-based surveys to monitor advertising practices, particularly when regulations prohibit promotional themes or content. Indeed, research on how consumers perceive advertising content represents an important empirical test of advertising content.

#### 4.1. Limitations

The current study has limitations common to survey research. The sample was recruited through a web panel, and therefore was not probability-based, which may limit generalizability. Non-probability panels pose issues such as self-selection bias, as members opt-in, and may not represent the broader population. Further, nonresponse, either in recruitment (non-contact, refusal, or unavailability) or through attrition, is usually prevalent with web panels. However, the sample included respondents in all provinces, and survey weights were applied to match national estimates for age, sex, and geographic region. The experimental design, as well as the use of three separate experiments and real ads were considerable strengths of the study. Although the main outcomes were based on self-report and were therefore subjective, this is the only way to assess ad perceptions.

#### 5. Conclusions

Despite regulations in Canada prohibiting the marketing of CEDs to children, CED ads are still perceived as targeting young people, including those aged 12–14 years and younger. In addition, counter to regulations in Canada, ads are seen as promoting CEDs for use during sports and with alcohol. This is concerning, given that the use of CEDs in these specific contexts is advised against, due to posing elevated risks. It is not surprising that associations are made between CEDs and their use during sports, as sports references in CED ads are explicit. In contrast, alcohol references in CED ads are less explicit, as they do not make direct references to alcohol, although they do show settings (such as parties and nightclubs) in which alcohol is commonly consumed. Our study, as well as research in other domains (U.S. Department of Health and Human Services, 2012), demonstrates that implicit or indirect references are sufficient to promote associations between CEDs and their use in particular contexts.

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#### Declaration of competing interest

None.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2019.104505>.

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