

## Use and Perceptions of Caffeinated Energy Drinks and Energy Shots in Canada

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**Introduction:** In Canada, energy drinks and energy shots are currently classified and regulated differently (food and drugs versus natural health products, respectively), on the assumption that they are used and perceived differently. The current study examined potential differences in use and perceptions of energy drinks and shots.

**Methods:** An online survey was conducted in 2015 using a national commercial online panel of youth and young adults aged 12–24 years ( $n=2,040$  retained for analysis in 2016). Participants were randomized to view an image of an energy shot or drink, and were asked about 14 potential reasons for using the product. Past consumption of each product was also assessed. Chi-square and t-tests were conducted to examine differences in use and perceptions between products.

**Results:** Overall, 15.6% of respondents reported using both energy shots and drinks. Of all respondents, <1% had tried only energy shots, whereas 58.0% had tried only energy drinks. For each product, the most commonly reported reasons for use were “to stay awake” and “to increase concentration or alertness.” Out of 14 potential reasons for use, respondents were significantly more likely to endorse seven of the reasons for energy drinks rather than shots; however, the magnitude of these differences was modest and the ordering of the reasons for use of each product was comparable.

**Conclusions:** Despite differences in prevalence of ever-use of energy shots and drinks, consumption patterns and perceived reasons for using the products are similar. The findings provide little support for regulating energy shots differently than energy drinks.

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### INTRODUCTION

Caffeinated energy drinks are one of the fastest growing sectors in the beverage industry.<sup>1</sup> In Canada, there is no particular standard of identity for caffeinated energy drinks; however, they are generally defined as beverages that contain caffeine, often in combination with other ingredients, such as taurine, glucuronolactone, B vitamins, minerals, and herbal ingredients.<sup>2</sup> Energy drinks are also typically marketed for their actual or perceived effects as stimulants, energizers, and performance enhancers.

Adverse health effects associated with excessive caffeine intake from energy drinks include nervousness, anxiety, irritability, insomnia, tremor, palpitations, abdominal pain, tachycardia, stroke, seizures, arrhythmias, and even death.<sup>3,4</sup> The consumption of energy

drinks by young people in particular has been associated with many adverse health effects as well as health-damaging behaviors including smoking, alcohol, and other substance use.<sup>5</sup> With the growing energy drink market, an increase in reported adverse events and emergencies due to excessive caffeine intake has also been observed.<sup>6</sup> As a result, public health concerns surrounding energy drink consumption have increased, especially for youth and young adults, who are frequently targeted in energy drink marketing, account for the

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greatest proportion of energy drink use, and are the most vulnerable to caffeine toxicity and adverse health effects.<sup>3,7,8</sup> Health Canada has established that for the average adult, up to 400 mg of caffeine per day is associated with no adverse health effects.<sup>9</sup> In comparison, a single-serving energy drink may not contain more than 180 mg of caffeine in Canada.<sup>2</sup> Specific energy drink recommendations depend on the ingredient profile of the energy drink; however, energy drinks are not recommended for children, pregnant or breastfeeding women, and those sensitive to caffeine.<sup>2</sup>

Energy shots, such as 5-hour ENERGY, typically contain many of the same ingredients as an energy drink. The main distinction between the two products is the volume of the container; although energy drinks on the Canadian market vary in size, typically from 250 mL to over 700 mL, energy shots have a maximum volume of 90 mL.<sup>2</sup> As an analogy, an energy drink is comparable to a cup of coffee whereas an energy shot is comparable to an espresso shot. However, despite their smaller size, energy shots often contain the same or even more caffeine than energy drinks, and are associated with many of the same adverse health effects.<sup>10</sup>

In Canada, prior to 2012, all energy drinks and shots were classified as natural health products. In 2012, energy drinks were re-classified under the Food and Drugs Act, and were therefore subject to new regulations including caffeine limits, marketing restrictions, and the use of cautionary statements on packaging.<sup>2</sup> However, energy shots remain classified as natural health products. The products were classified differently by Health Canada based on the assumption that, unlike energy drinks, energy shots are not consumed or perceived as food, due to their smaller volume and product representation.<sup>2</sup> Consequently, energy shots are not subject to the same restrictions as energy drinks. For example, although a 57 mL container of 5-hour ENERGY contains 200 mg of caffeine, a single-serving energy drink may not contain more than 180 mg of caffeine. In other countries, such as the U.S., energy drinks and energy shots are subject to the same regulations.<sup>10</sup> In the U.S., these products fall under the Federal Food, Drug, and Cosmetic Act.

Few published studies exist on energy shot consumption and the extent to which patterns of use may differ from energy drink consumption. One U.S. study of students in eighth, tenth, and twelfth grade found that between 9% and 12% of students reported recently consuming energy shots, while 29% to 35% reported recently consuming energy drinks.<sup>11</sup> Almost all energy shot users also reported consuming energy drinks. Males were more likely than females to use energy shots, a trend similar to that of energy drinks. Another U.S.

study, which examined consumption of highly-fortified products (i.e., products with added vitamins and minerals, such as energy drinks, energy shots, sports drinks, energy bars, and protein bars), found that 12% of respondents consumed energy shots, while 29% of respondents consumed energy drinks.<sup>12</sup>

There is very little evidence on consumer perceptions of energy shots outside of industry and market research. Evidence from the first wave of the current study conducted in 2014 revealed that the majority of youth perceive energy shots as energy drinks.<sup>10</sup> A related qualitative study found that despite a smaller container size, many youth in Canada considered energy shots as energy drinks.<sup>13</sup> For example, participants classified 5-hour ENERGY under the energy drink category given it had the term “energy” on the packaging. Further, a U.S. study found users reported consuming energy drinks and energy shots for similar reasons, with the top two reasons for use being a boost in energy and increased mental alertness.<sup>14</sup>

The current study examines use and perceived reasons for use of caffeinated energy drinks and shots to determine whether there are differences in how the products are used and perceived by youth and young adults in Canada.

## METHODS

Data were collected via self-completed, online surveys, between November 6, 2015 and December 22, 2015 and data were analyzed in November 2016.

### Study Sample

Respondents were recruited via email through the Legerweb consumer panel, which has over 400,000 active members, half of them sampled using probability-based methods.<sup>15</sup> Respondents aged 18–24 years were recruited directly. Respondents aged 12–17 years 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. Respondents received remuneration from Leger 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 2,181 respondents completed the survey. Records were deleted due to missing data on variables used for weighting and ever-use of energy drinks ( $n=37$ ), completion outside of the study timeframe ( $n=1$ ), and failing a data quality check question that asked for the current month ( $n=103$ ). Thus, a total of 2,040 were retained for analysis.

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.

## Measures

Prior to answering any study questions or reading any explanations of products, participants were randomized to view an image of either an energy shot ( $n=990$ ) or energy drink ( $n=1,051$ ), of the same brand (Figure 1). With the product image on screen, participants were asked: *Do people use this product for any of the following reasons?* and could select all that applied from the following list of 14 response options, shown in random order: *To stay awake, To increase concentration or alertness, To improve sports performance or physical activity, For going out or partying, Friends drink them, To mix with alcohol, For the taste, To cope with a hangover, These products are cool, To sober up after drinking alcohol, For the vitamins, To help lose weight or help keep weight off, For the herbal ingredients,* and *Other*. The development of this measure was informed by focus groups conducted among youth and young adults.<sup>13</sup>

All respondents were asked: *Have you ever tried an energy drink, even a few sips?* All respondents who had ever tried energy drinks were asked questions related to their consumption patterns. Respondents were asked: *How old were you when you first tried an energy drink, even just a few sips?* Respondents were also asked: *When was the LAST TIME you had an energy drink?* Response options ranged from: *In the last 24 hours, In the last 7 days, In the last 30 days, In the last 6 months, In the last 12 months, More than 12 months ago,* and *Don't know*. Respondents were then asked: *How many energy drinks have you consumed in your life?* Response options were: *None, 1 drink or less, 2–5 drinks, 6–10 drinks, 11–20 drinks, 21–50 drinks, 51–100 drinks, More than 100 drinks,* and *Don't know*. Those who reported “none” for lifetime consumption ( $n=24$ ) were excluded from estimates related to consumption of energy drinks. Respondents were also asked: *What is the largest number of energy drinks you have ever had IN ONE DAY?* Participants were then asked: *In the questions you have answered so far about energy drinks, did you include energy SHOTS in your answers?* If participants included shots in their answers, they were prompted to: *Please answer the following questions again, separately for energy DRINKS and energy SHOTS*. If participants did not include shots in their answers, they proceeded to answer parallel questions for shots. Those who reported “none” for lifetime consumption of shots ( $n=1$ ) were excluded from estimates related to consumption of energy shots.



**Figure 1.** Energy drink and energy shot images used in experimental conditions.

## Statistical Analysis

Post-stratification sample weights were constructed based on population estimates from the 2011 National Household Survey.<sup>16</sup> Sample probabilities were created for 40 demographic groups (age group X sex X region) based on weighted National Household Survey proportions, and applied to the data set. Estimates reported are weighted unless otherwise specified. Chi-square and t-tests were conducted to examine differences in sample characteristics, past use, and reasons for use between energy drinks and energy shots. A logistic regression model was conducted to examine sociodemographic correlates of using energy shots. All ORs are adjusted for other covariates included in the model (AORs). Analyses were conducted using SPSS, version 23.

## RESULTS

The sample characteristics of the respondents are presented in Table 1. There were no significant differences between experimental conditions for any variables except gender (54.0% males and 46.0% females in drink condition vs 48.5% males and 51.5% females in shot condition, chi-square, 6.20;  $p=0.01$ ).

Overall, 15.6% of respondents reported ever using both energy shots and energy drinks. Of all respondents, <1% had tried energy shots only, whereas 58.0% had tried energy drinks only. Consumption of caffeinated energy shots and caffeinated energy drinks among users of each product are presented in Table 2. Among “dual users” of both energy drinks and shots ( $n=273$ ), 58.3% had tried energy drinks before energy shots, 6.0% had tried energy shots before energy drinks, and 35.7% had tried energy shots or energy drinks at the same age. Among users of either energy drinks or shots, there were no differences between the mean maximum number of products (energy drinks or shots) consumed in 1 day and the mean maximum number of energy shots consumed in 1 day; however, “dual users” reported using a greater number of energy drinks in 1 day (mean=2.3 for energy drinks vs 1.7 for shots,  $t=5.64$ ,  $p<0.001$ ).

A logistic regression model was conducted to examine sociodemographic correlates of using energy shots. Males were more likely to use shots than females (21.3% vs 12.4%, AOR=1.9, 95% CI=1.5, 2.5,  $p<0.001$ ). The odds of consuming shots also differed by age (chi-square, 47.9;  $p<0.001$ ): respondents aged 21–24 years (24.6%) were more likely to report using shots than those aged 12–14 years (10.7%, AOR=3.0, 95% CI=2.0, 4.3), 15–17 years (14.0%, AOR=2.2, 95% CI=1.6, 3.0), or 18–20 years (14.5%, AOR=2.0, 95% CI=1.4, 2.7). English speakers were more likely to report using shots than French speakers (19.6% vs 7.7%, AOR=2.9, 95% CI=1.5, 5.6,  $p=0.002$ ). The odds of consuming shots also differed by region (chi-square, 13.0;  $p=0.01$ ): residents of British

**Table 1.** Sample Characteristics (Weighted N=2,041)

Characteristics	Unweighted % (n)	Weighted %
Gender		
Female	49.5 (1,009)	48.7
Male	50.5 (1,031)	51.3
Age, years		
12-14	19.5 (397)	21.3
15-17	30.1 (616)	23.5
18-20	16.4 (334)	21.5
21-24	34.0 (693)	33.7
Language		
English	60.3 (1,231)	78.1
French	39.7 (809)	21.9
Region		
British Columbia	7.4 (150)	12.8
Prairies (AB, SK, MB)	13.2 (270)	18.5
Ontario	31.0 (632)	39.8
Quebec	43.2 (881)	22.5
Atlantic (NB, NL, NS, PEI)	5.2 (107)	6.4
Race		
White (only)	73.8 (1,505)	66.9
Mixed/Other/Don't know/Refuse to answer	23.1 (472)	29.3
Aboriginal (any)	3.1 (63)	3.8

AB, Alberta; MB, Manitoba; NB, New Brunswick; NL, Newfoundland; NS, Nova Scotia; PEI, Prince Edward Island; SK, Saskatchewan.

Columbia (26.6%) were more likely to report using shots than residents from the Prairie provinces (18.3%, AOR=1.7, 95% CI=1.2, 2.6), Ontario (18.0%, AOR=1.6, 95% CI=1.2, 2.3), Quebec (8.9%, AOR=1.9, 95% CI=1.0,

3.8) and the Atlantic provinces (15.9%, AOR=2.2, 95% CI=1.3, 3.9). The odds of consuming shots also differed by race/ethnicity (chi-square, 6.3;  $p=0.04$ ): Aboriginal respondents (22.1%) were more likely to

**Table 2.** Consumption Patterns of Energy Shots and Energy Drinks, Among Users of Each Product

Consumption patterns	Energy shots (n=335)	Energy drinks (n=1,505)
Lifetime consumption, % (n)		
≤1 drink	30.7 (103)	27.3 (411)
2-5 drinks	25.9 (87)	22.4 (337)
6-10 drinks	15.5 (52)	12.1 (183)
11-20 drinks	7.2 (24)	10.4 (157)
21-50 drinks	7.8 (26)	12.3 (184)
51-100 drinks	4.2 (14)	6.2 (94)
> 100 drinks	2.4 (8)	6.1 (91)
Don't know	6.3 (21)	3.2 (48)
Age of initiation (years), M (SD)	16.0 (3.6)	15.0 (2.8)
	Missing (n=43)	Missing (n=123)
Last time, % (n)		Missing (n=3)
In the last 24 hours	4.2 (14)	9.4 (142)
In the last 7 days	9.3 (31)	14.6 (219)
In the last 30 days	12.8 (43)	13.7 (206)
In the last 6 months	15.5 (52)	21.2 (318)
In the last 12 months	14.6 (49)	10.1 (151)
> 12 months ago	37.9 (127)	28.7 (432)
Don't know	5.7 (19)	2.3 (34)
Maximum number of products consumed in 1 day, M (SD)	1.7 (1.8)	1.7 (2.3)
	Missing (n=27)	Missing (n=83)

**Table 3.** Perceived Reasons for Product Use Selected by Respondents, by Experimental Condition (Product)

Reason	Energy shots, % (n) (n=990)	Energy drinks, % (n) (n=1,051)	$\chi^2$ , p-value
To stay awake	60.1 (595)	72.8 (764)	36.73, <b>p &lt; 0.001</b>
To increase concentration or alertness	38.9 (386)	48.1 (506)	17.53, <b>p &lt; 0.001</b>
To improve sports performance or physical activity	33.2 (329)	33.4 (351)	0.006, p=0.94
For going out or partying	23.0 (228)	33.2 (349)	26.03, <b>p &lt; 0.001</b>
Friends drink them	21.4 (212)	37.1 (390)	60.60, <b>p &lt; 0.001</b>
To mix with alcohol	15.5 (153)	31.2 (328)	70.24, <b>p &lt; 0.001</b>
For the taste	12.6 (124)	30.2 (317)	93.84, <b>p &lt; 0.001</b>
To cope with a hangover	12.5 (123)	14.9 (156)	2.56, p=0.11
These products are cool	11.9 (118)	25.1 (263)	57.82, <b>p &lt; 0.001</b>
To sober up after drinking alcohol	9.7 (96)	9.6 (101)	0.004, p=0.95
For the vitamins	4.1 (41)	3.9 (41)	0.08, p=0.78
To help lose weight or help keep weight off	4.1 (41)	3.1 (33)	1.45, p=0.23
For the herbal ingredients	1.4 (14)	2.0 (21)	1.03, p=0.31
Other	0.5 (5)	0.3 (3)	0.63, p=0.43
None of the above	6.5 (64)	5.0 (52)	2.17, p=0.14
Don't know	15.3 (152)	4.8 (50)	64.07, <b>p &lt; 0.001</b>

Note: Boldface indicates statistical significance ( $p < 0.001$ ). Column totals do not add to 100% as respondents could select all that apply. Refused to answer ( $n=1$ ).

report using shots than those who identified as white only (16.5%, AOR=1.2, 95% CI=0.7, 2.1) and “mixed or other” race/ethnicity (17.3%, AOR=1.6, 95% CI=0.9, 3.0).

Perceived reasons for product use by experimental condition (i.e., product) are presented in Table 3. The most commonly reported reasons for use of each product were “to stay awake” and “to increase concentration or alertness,” although the proportions of respondents selecting each varied significantly by product as they did for five other reasons. There were no differences by product in the proportions of respondents selecting seven of the reasons for use: to improve sports performance or physical activity, to cope with a hangover, to sober up after drinking alcohol, for the vitamins, to help lose weight or help keep weight off, for the herbal ingredients, and “other”; similar proportions in each condition also selected “none of the above.” Whereas 15% of respondents selected “don't know” as a reason for using energy shots, 5% selected “don't know” for energy drinks. After accounting for differences in gender between experimental conditions in a logistic regression model, the results remained the same.

## DISCUSSION

The current findings suggest that although prevalence of ever-use of energy drinks and shots differ, consumption patterns are generally similar. Energy drink use was more

prevalent, and these products were used at an earlier age compared to energy shots, possibly because energy shots have appeared more recently in the marketplace, and energy drinks are more readily available. An alternative explanation for energy drinks being used at a relatively earlier age might be that energy drink users progress from energy drinks to energy shots, akin to a gateway effect. Different patterns of use may also reflect different marketing practices; however, this has yet to be explored, to the authors' knowledge. Overall, there were modest differences in product use with respect to the last time of use and lifetime consumption. The mean maximum number used in 1 day reported by users was the same for energy drinks and shots (1.7 products). The current findings are generally consistent with previous literature. For example, among high school students, energy drink use was more prevalent than energy shot use, and almost all energy shot users also used energy drinks.<sup>11</sup> Also consistent with previous literature, males were more likely than females to use shots.<sup>11,12,14</sup>

Overall, respondents selected similar reasons for why people use energy drinks and energy shots. Although statistically significant differences were observed for several reasons, the magnitude of these differences was modest. Indeed, the ordering of the reasons for use was very comparable for energy shots and drinks. Most of the differences were due to higher proportions of respondents endorsing reasons for energy drink use, which may be a reflection of their greater availability and popularity compared to energy shots, rather than a difference in perceived product function. Further, a lower proportion

of respondents endorsing reasons for energy shot use may also be explained by a significantly higher number of respondents reporting “don’t know” as a reason for using energy shots in comparison to energy drinks. These findings are comparable to previous studies that reported very similar perceptions of energy shots and drinks.<sup>13,14</sup>

### Limitations

This study has several limitations common to survey research. First, the sample was not recruited using probability-based methods, but rather through a commercial panel. Although Internet access is almost universal among the targeted age group, the sample may nevertheless have under-represented lower income respondents. Post-stratification weights were applied to match national estimates for age, gender, and region. Over-reporting, under-reporting, or misreporting in the current study is a possibility, especially in questions related to consumption of energy drinks and energy shots. Further, the survey was limited to youth and young adults and therefore may not be applicable to other age groups.

### CONCLUSIONS

Based on the current findings, there is little evidence to support separate regulatory requirements for energy shots and energy drinks in Canada. Although there are differences in ever-use of energy shots and drinks, consumption patterns are generally similar and each product is perceived to be used for similar reasons among youth and young adults. Regulatory agencies should ensure that existing policies do not provide a commercial advantage to any subcategory of energy drinks in the absence of evidence to support differential regulation. More importantly, existing policies should promote accurate risk perceptions across product subcategories, particularly given that health effects of energy shots are at least equivalent to those of energy drinks.<sup>3,17</sup>

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