

At-a-glance

Perceptions of caffeinated drinks among youth and young adults in Canada

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Abstract

The current study assessed youth and young adults' perceptions and attitudes toward caffeine and energy drinks (EDs). An online survey was conducted with 2036 panelists aged 12–24, about caffeine and ED knowledge, caffeine perceptions, and perceptions of ED safety. Few respondents (2.1%) could state Health Canada's recommended limit for caffeine intake, although most participants (64.9%) correctly stated the maximum number of EDs that should be consumed per day. When shown four beverages, only 17.5% correctly identified the beverage with the most caffeine. Overall, young people generally have low levels of knowledge about caffeine amounts and intake from caffeinated beverages.

Keywords: *caffeine, energy drinks, perceptions, attitudes, adolescents*

Introduction

When consumed in moderation by adults, caffeine is generally safe.¹ However, there are growing concerns regarding the health effects of caffeine consumption among young people. Caffeine has been linked to altered sleep patterns, increased sugar consumption, and mental health problems among young people, and there are concerns about the effects of caffeine consumption during the period of active brain development.^{2–6}

According to Health Canada, adolescents older than 12 years should consume no more than 2.5 mg/kg in body weight of caffeine daily.¹ Canadian data on young people's caffeine consumption is limited,⁷ although US data from 2009–2010 suggested that 71% of respondents aged 2–19 consumed caffeine on a given day, and at least 10% of caffeine consumers aged 12–19 ingested more than 2.45 mg/kg per day.⁸

The caffeinated beverage market continues to expand with new products, such as energy drinks (EDs) and energy shots,

several of which are targeted to young people.⁹ Previous studies suggested that many young people were unaware of caffeine amounts or daily intake recommendations, often confused caffeinated and non-caffeinated beverages (such as sports drinks), and had mixed perceptions of ED safety.^{10–13} This study examined knowledge of maximum daily intake recommendations for caffeine and EDs, knowledge of relative amounts of caffeine in beverages, and perceptions of caffeine's effects and ED safety.

Methods

Data were collected via self-completed, web-based surveys conducted in 2015 among 2036 Canadians.

The study was reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #19401).

Measures

Additional description and specific wording of all measures are publicly available.¹⁴

Highlights

- Young people generally had low levels of knowledge about specific caffeine intake recommendations, with a large majority of respondents unable to report the recommended maximum daily intake for caffeine.
- Young people tended to have somewhat higher levels of knowledge regarding energy drink intake recommendations and ingredients than specific caffeine intake recommendations.
- More than a third of young people reported that caffeine could help them play sports and lose weight, and felt that it was safe to use energy drinks while being physically active.

Caffeine knowledge and perceptions

Participants were asked whether they knew the maximum daily intake for caffeine recommended by Health Canada for someone their age and, if so, to enter the number of milligrams. Respondents were also shown images of four beverages (473mL Monster ED, large Tim Horton's coffee, 591mL Coca-Cola, and 591mL Gatorade) and asked to select the one with the most caffeine. Perceptions of caffeine's effects were assessed using agreement with seven statements (Table 1). Responses were coded numerically from 1 (strongly disagree) to 5 (strongly agree) and summed to create an index of caffeine's perceived positive effects.

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Energy drink knowledge and perceptions

Respondents were shown an image of an ED can (473mL) and were asked: “What is the maximum number of cans of this product someone your age should have in one day?”. Respondents were also asked to identify the “...main ingredient(s) in energy drinks that give the energy boost?”,

and whether the “main ingredients” in sports drinks were the same ingredients that give the energy boost in EDs. In addition, respondents were asked whether they perceived EDs to be good or bad for their health. Lastly, eight items assessed perceived addictiveness of caffeine and perceived safety of energy drinks (Table 1).

Responses were coded numerically from 1 (definitely not safe) to 5 (definitely safe) and summed to create an index of perceived ED safety. For both the effects and safety indices, “don’t know” responses were recoded as “in the middle” to avoid exclusion from the index; missing responses were excluded. Items were reverse coded when appropriate.

TABLE 1
Perceived caffeine effects and perceptions of energy drink safety among youth and young adults

Effects	Strongly disagree, % (n)	Disagree, % (n)	In the middle, % (n)	Agree, % (n)	Strongly agree, % (n)	Don't know, % (n)
Caffeine makes me feel anxious. (n = 2033)	10.6% (216)	23.6% (479)	26.1% (530)	20.4% (414)	4.9% (100)	14.4% (294)
I like the way caffeine makes me feel. (n = 2032)	7.3% (149)	12.9% (262)	38.7% (786)	23.6% (479)	5.0% (102)	12.5% (254)
Caffeine makes it hard for me to sleep at night. (n = 2034)	6.8% (139)	13.8% (281)	18.7% (380)	34.1% (694)	15.6% (318)	10.9% (222)
Caffeine can help me study. (n = 2035)	8.3% (169)	13.7% (279)	21.6% (440)	37.8% (769)	9.2% (188)	9.3% (190)
Caffeine helps me to play sports. (n = 2035)	18.7% (381)	28.1% (571)	25.9% (527)	13.6% (277)	2.0% (41)	11.7% (238)
Caffeine can help me lose weight or help keep weight off. (n = 2034)	20.0% (407)	28.3% (575)	23.4% (476)	8.0% (164)	1.8% (37)	18.5% (375)
Caffeine is addictive. ^a (n = 2035)	4.3% (88)	8.0% (164)	14.7% (299)	46.8% (952)	19.6% (399)	6.6% (134)
Is it safe...	Definitely not, % (n)	Probably not, % (n)	In the middle, % (n)	Probably, % (n)	Definitely, % (n)	Don't know, % (n)
...for you to use energy drinks? (n = 2035)	20.6% (419)	35.6% (725)	24.1% (490)	14.9% (304)	1.5% (30)	3.4% (68)
...for children to use energy drinks? (n = 2035)	66.2% (1347)	23.3% (475)	5.0% (102)	2.5% (52)	0.6% (13)	2.3% (47)
...for pregnant/breastfeeding women to use energy drinks? (n = 2034)	65.9% (1340)	24.2% (492)	2.5% (51)	1.2% (24)	0.9% (17)	5.4% (109)
...to mix alcohol with energy drinks? (n = 2034)	52.8% (1074)	30.2% (614)	7.2% (146)	3.9% (79)	1.0% (21)	5.0% (101)
...to use energy drinks while working out or playing sports? (n = 2035)	22.0% (447)	32.2% (654)	21.8% (443)	15.6% (317)	1.7% (34)	6.9% (140)
...to use energy drinks to help you study? (n = 2035)	17.4% (353)	27.5% (559)	29.0% (590)	16.6% (338)	3.1% (64)	6.4% (131)
...for people your age to drink more than the daily maximum number of cans/bottles printed on the container? (n = 2034)	54.0% (1098)	31.1% (632)	7.1% (144)	3.7% (75)	1.0% (19)	3.2% (66)

^a Item is part of the safety index.

Statistical analysis

Analyses included descriptive statistics, as well as linear regression analyses with pairwise model selections examining socio-demographic correlates of perceived caffeine effects and perceived ED safety indices [$\hat{y} = B_0 + \text{gender}(x) + \text{age}(x) + \text{language}(x) + \text{region}(x) + \text{ethnicity}(x) + \Sigma$]. The Bonferroni correction was applied to all p levels to adjust for multiple pairwise comparisons. Post-stratification sample weights were constructed and applied to the dataset. Estimates reported in text are weighted unless otherwise specified. All analyses were conducted using IBM SPSS Statistics 24.

Results

Sample characteristics

Demographic characteristics of the sample are reported elsewhere.¹⁴ Respondents were between the ages of 12-24, residents of Canada (excluding the territories), and the majority were White (67.0%, unweighted) and English-speaking (78.1%, unweighted).

Caffeine knowledge

Overall, 5.1% of respondents ($n = 104$) reported knowing the maximum daily intake for caffeine recommended by Health Canada for their age, while 94.9% ($n = 1928$) responded with “no” or “don’t know”. However, not all who reported knowing the maximum daily intake provided a correct response when prompted: only 2.1% ($n = 42$) of the 2036 respondents could correctly state the maximum daily intake for caffeine. When shown four beverages, and asked to select the one with the most caffeine, most respondents selected the ED (60.5%, $n = 1231$), while only 17.5% ($n = 355$) correctly identified coffee as having the most caffeine. Fewer respondents selected Coca-Cola (13.9%; $n = 283$) or Gatorade (0.8%; $n = 17$), and 7.3% ($n = 147$) selected “don’t know”.

Caffeine effects

As shown in Table 1, most respondents chose “in the middle” when asked to rate their agreement with “Caffeine makes me feel anxious” and “I like the way caffeine makes me feel”. Most respondents agreed that caffeine could help them study and made it hard to sleep at night, while most disagreed that caffeine could help them lose weight or play sports. Most respondents agreed that caffeine was addictive.

Table 2 displays the results of separate linear regression models examining sociodemographic correlates of indices of perceived caffeine effects and perceived ED safety. Sex and age were significantly associated with index scores for perceived caffeine effects. Specifically, respondents who were male and older scored higher, indicating that these groups perceived caffeine’s effects more positively.

Energy drink knowledge

When shown an image of an ED and asked the maximum number of cans someone their age should consume in one day, most respondents (64.9%, $n = 1318$) correctly stated “one” or fewer, while 18.7% ($n = 380$) responded incorrectly (> 1), and 16.3% ($n = 331$) did not know.

When respondents were asked to state the main ingredients in energy drinks that give the energy boost, caffeine was reported most frequently (41.1%, $n = 836$), followed by sugar (12.8%, $n = 260$), taurine (10.6%, $n = 216$), guarana (3.5%, $n = 70$), vitamins (3.3%, $n = 66$), ginseng (3.1%, $n = 64$) and other ingredients (1.1%, $n = 22$). Most respondents (63.2%, $n = 1286$) correctly believed that the main ingredients in sports drinks were not the same ingredients that give the energy boost in EDs, although 7.5% ($n = 153$) believed they were the same and a substantial proportion (29.3%, $n = 596$) did not know.

Perceptions of energy drinks

Three-quarters of respondents thought that EDs were bad for your health: 46.6% ($n = 950$) selected “Bad for your health” and 29.6% ($n = 603$) selected “Very bad...”. Very few said, “Good for your health” (2.4%, $n = 49$) or “Very good...” (0.5%, $n = 11$), while 17.9% ($n = 364$) said “Neither good nor bad”, and 2.9% ($n = 60$) did not know.

Perceived energy drink safety

Table 1 presents responses to items regarding ED safety. Most respondents indicated it was “definitely not” or “probably not” safe for themselves to use EDs, or to use EDs while working out or playing sports. Most respondents also indicated it was “definitely not” safe for children or pregnant/breastfeeding women to use EDs, to mix EDs with alcohol, or to consume more than the daily maximum number of cans/bottles printed on the container.

Sex, age, language, ethnicity, and region were all significantly associated with scores on the index of perceived ED safety (Table 2). Specifically, respondents who were male, aged 12-14 (vs. 18-20), English-speaking, and of other/mixed race/ethnicity scored higher, demonstrating that these groups perceived EDs as safer. Residents of Atlantic Canada had lower scores, demonstrating that they perceived EDs as less safe.

Discussion

Young people generally have low levels of knowledge about specific caffeine intake recommendations, with most respondents unable to report the recommended maximum daily intake. Although Health Canada has established recommendations,¹ few efforts have been undertaken to communicate these guidelines to consumers. In addition, recommendations are presented in mg/kg of body weight for adolescents, which may be too complex and cause misunderstandings.

Young people had somewhat higher levels of knowledge regarding ED intake recommendations and ingredients. Health Canada requires that EDs display a cautionary statement on the packaging¹⁵ presented as maximum number of containers, which is an easy-to-understand unit and may help explain the knowledge difference between caffeine in general and EDs specifically. Despite higher levels of knowledge for recommended maximum ED consumption compared to caffeine, one-third of respondents did not know, or gave an incorrect number for, the recommended limit for ED consumption.

Lastly, the study found that over one-third of young people reported that caffeine can help them play sports or lose weight, and felt it safe to use EDs while physically active. This is of particular concern as caffeine consumption is not recommended by Health Canada during intense physical activity, due to an increased risk of adverse events.¹⁵

Limitations

Limitations to the study include response biases such as social desirability, and a lack of probability-based recruitment methods; however, post-stratification weights were used to ensure representative distributions of demographic variables.

TABLE 2
Estimates from the linear regression models for indices of perceived caffeine effects and energy drink safety

Characteristic	Perceived caffeine effects (n = 1757)			Perceived energy drink safety (n = 1758)		
	<i>p</i>	Beta (95% CI)	<i>p</i> ^a	<i>p</i>	Beta (95% CI)	<i>p</i> ^a
Intercept	<i>p</i> < 0.001	16.74 (15.64, 17.85)		<i>p</i> < 0.001	14.43 (12.74, 16.11)	
Sex	<i>p</i> < 0.001			<i>p</i> < 0.001		
Female (ref) vs. Male		0.55 (0.28, 0.81)	< 0.001		1.57 (1.17, 1.97)	< 0.001
Age group	<i>p</i> < 0.001			<i>p</i> = 0.02		
12-14 (ref) vs. 15-17		0.89 (0.51, 1.28)	< 0.001		-0.25 (-0.84, 0.34)	1.00
12-14 (ref) vs. 18-20		1.12 (0.71, 1.53)	<0.001		-0.96 (-1.58, -0.34)	0.02
12-14 (ref) vs. 21-24		1.34 (0.96, 1.72)	<0.001		-0.49 (-1.07, 0.09)	0.60
15-17 (ref) vs. 18-20		0.23 (-0.14, 0.60)	1.00		-0.71 (-1.28, -0.14)	0.09
15-17 (ref) vs. 21-24		0.45 (0.10, 0.79)	0.07		-0.24 (-0.76, 0.29)	1.00
18-20 (ref) vs. 21-24		0.22 (-0.15, 0.59)	1.00		0.47 (-0.09, 1.03)	0.59
Language of survey	<i>p</i> = 0.12			<i>p</i> = 0.02		
English (ref) vs. French		–	–		-1.19 (-2.18, -0.21)	0.02
Race/Ethnicity	<i>p</i> = 0.04			<i>p</i> < 0.001		
White (ref) vs. mixed/other		0.28 (-0.03, 0.60)	0.23		1.56 (1.08, 2.04)	< 0.001
White (ref) vs. Aboriginal		-0.57 (-1.29, 0.15)	0.36		0.14 (-0.96, 1.23)	1.00
Mixed/other (ref) vs. Aboriginal		-0.85 (-1.59, -0.11)	0.07		-1.42 (-2.56, -0.29)	0.04
Region of residence	<i>p</i> = 0.97			<i>p</i> = 0.01		
BC (ref) vs. PR		–	–		-0.32 (-1.06, 0.43)	1.00
BC (ref) vs. ON		–	–		-0.06 (-0.70, 0.58)	1.00
BC (ref) vs. QC		–	–		-1.01 (-2.13, 0.10)	0.75
BC (ref) vs. ATL		–	–		-1.51 (-2.50, -0.52)	0.03
PR (ref) vs. ON		–	–		0.26 (-0.34, 0.86)	1.00
PR (ref) vs. QC		–	–		-0.70 (-1.77, 0.38)	1.00
PR (ref) vs. ATL		–	–		-1.19 (-2.14, -0.25)	0.13
ON (ref) vs. QC		–	–		-0.95 (-1.96, 0.05)	0.62
ON (ref) vs. ATL		–	–		-1.45 (-2.33, -0.57)	0.01
QC (ref) vs. ATL		–	–		-0.50 (-1.72, 0.72)	1.00

Abbreviations: ATL, Atlantic (New Brunswick, Newfoundland & Labrador, Nova Scotia, Prince Edward Island); BC, British Columbia; CI, confidence interval; ON, Ontario; QC, Quebec; PR, Prairies (Alberta, Manitoba, Saskatchewan).

^a All *P*-values adjusted using Bonferroni correction

– : Not applicable.

Conclusion

Our findings suggest that among young Canadians, males perceive caffeine effects more positively and EDs as safer, and younger adolescents and those of other/mixed race/ethnicity view EDs as safer. Future research should explore methods to increase young people's knowledge of caffeine and ED recommendations and risks, particularly for those groups who view EDs as safe. Given market trends, additional research should also examine the use of caffeinated products during physical activity, and monitor caffeine intake among young people.

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Conflicts of interest

There are no conflicts of interest to report.

Authors’ contributions and statement

D.H. and J.L.R. were involved in the study design and data collection. All authors (B.C., J.L.R., and D.H.) were involved in data analysis and manuscript preparation, including drafting and revisions.

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