



SHORT REPORT

Prevalence and pattern of energy drink intake among Australian adolescents

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Abstract

Background: Energy drinks (ED) are popular among young people despite evidence of associated health risks. Research into the prevalence and pattern of ED intake among young people is sparse. The present study investigates the prevalence and pattern of ED intake among a large sample of adolescents, including how many consume them, how often, for what reasons and in what contexts.

Methods: In 2018, all students in grades 7–12 attending 25 randomly selected Western Australian schools were invited to complete an online self-report survey about EDs.

Results: Of the 3688 respondents, 51.2% reported consuming an ED. Of these 'ever consumers', 23.4% drank them monthly, 19.2% weekly and 2% every day. The average age of first intake was 10.7 years. One-fifth (19.7%) of 'ever consumers' reported consuming more than two EDs in 1 day. Reasons for ED use included taste, to boost energy levels, sport performance and studying.

Conclusions: The findings add to limited international evidence about adolescent ED use and provide valuable information to help ensure interventions to reduce intake address the underlying reasons and contexts of ED consumption.

Introduction

Energy drinks (EDs) are flavoured, non-alcoholic beverages that contain caffeine and are marketed to improve mental and/or physical performance ⁽¹⁾. Often brightly coloured and attractively packaged, EDs have catapulted to popularity among young people and have become one of the fastest growing segments of the beverage market. Although comparable to soft drinks in sugar and energy content, EDs contain, on average, around three or more

times the amount of caffeine (around 160 mg per 500 mL in Australia, which is equivalent to two cups of instant coffee). Other common ingredients include amino acids, herbal stimulants and sodium, which may interact with caffeine and exacerbate its effects ⁽²⁾.

Energy drinks have been associated with a wide range of adverse health outcomes. For example, two recent systematic reviews of serious adverse events occurring following consumption of EDs have linked EDs with a number of cardiovascular and neurological problems,

including arrhythmias, myocardial ischaemia, aneurysm/dissection, cardiac arrest, vasospasm, coronary thrombosis, cardiomyopathies, hypertension, seizures, cerebrovascular accident and neuro-psychiatric events (suicidal ideation and psychosis) ^(2,3). There is also evidence linking ED intake in children, adolescents and young adults with higher rates of smoking, alcohol (including binge-drinking) and other substance use, sensation seeking, self-destructive behaviour, problems with behavioural regulation and metacognitive skills, increased sedentary behaviour, headaches, stomach aches, hyperactivity and sleeping problems, insomnia, tiredness/fatigue, irritation, and hyperactivity/inattention symptoms ⁽⁴⁾. Concern over the health effects associated with these drinks has prompted several countries to ban the sale of these drinks to people aged under 18 years, or altogether.

A recent review into the consumption of EDs by young people noted that, despite the growing ED market and reports of serious adverse events associated with their consumption, research into ED use was sparse, with most studies being conducted in Europe or North America ⁽⁴⁾. For example, in 2011, the European Food Safety Authority (EFSA) commissioned a study to gather ED consumption data on over 52 000 people within 16 countries of the European Union and found adolescents (aged 10–18 years) had the highest prevalence of consumption (68%) followed by adults (18–65 years, 30%) and children (3–10 years, 18%) ⁽⁵⁾. Thus, consideration of the patterns and reasons for ED use and non-use among adolescents (a key ED consumer group) may help inform future interventions.

The present study aimed to investigate quantitatively the prevalence and pattern of ED intake among a large sample of Australian adolescents, including how many consume them, which brands are commonly consumed, how often, for what reasons and in what contexts. The reasons why adolescent non-ED users choose not to drink EDs were also explored.

Materials and methods

School selection and participants

Non-government ($n = 30$) and government ($n = 65$) Western Australian schools were randomly selected based on their school Index of Community Socio-Educational Advantage (ICSEA) score ⁽⁶⁾ to ensure representation across socio-economic status. School principals were contacted and invited to participate in the 'AMPED UP: An Energy Drink Study', which involved an online survey completed by secondary school students during class time. Of the 95 schools contacted, 25 (26%) agreed to participate.

All grade 7–12 students in participating schools were invited to take part (except for three schools only able to

invite grades 7–10). Student participation via active parental consent was 27%, ranging from 10%–66% of the entire school.

Amped up survey

Survey questions were adapted from the 2015 Canadian Adolescent and Young Adult Energy Drink Survey by Hammond *et al.* ⁽⁷⁾ and included socio-demographics and a range of items to measure prevalence, pattern, context and reasons for ED intake and non-ED intake.

Ethics

Ethics approval was obtained from The University of Western Australia's Human Research Ethics Committee, The WA Department of Education, The WA Catholic Education Office and the Association for Independent Schools of WA. Active informed consent was obtained from each school principal as well as each participating child and their parent/guardian.

Statistical analysis

Of the 3837 surveys received, 3688 met minimal data requirements (i.e. contained data on ED intake). Descriptive statistics were generated in SPSS, version 25 (IBM Corp., Armonk, NY, USA) and were used to answer the research aim.

Results

Participant characteristics and prevalence of ED consumption is shown in Table 1.

The top five ED brands preferred by participants included 'Red Bull™' (Red Bull GmbH, Fuschl, Austria) ($n = 544$), 'Monster™' (Monster Energy Company, Warriewood, NSW, Australia) ($n = 372$), 'Mother™' (Coca-Cola Amatil (Aust) Pty Ltd, Northmead, NSW, Australia) ($n = 309$), 'V™' (Frucon Suntory Australia Pty Ltd, North Strathfield, NSW, Australia) ($n = 289$) and 'Rockstar™' (Frucon Beverages (Australia) Pty Ltd, North Strathfield, NSW, Australia) ($n = 212$) (all these ED brands contain a similar caffeine content). EDs were more likely to be consumed on weekends (69%) than weekdays (31%). The most common time of day for ED consumption was in the afternoon (13.30 h to 17.30 h). Fifteen percent of ED 'ever consumers' (defined as ever tried an ED, even a few sips) reported 'always' or 'usually' consuming a sugar-free or low-energy ED. One quarter of ED 'ever-consumers' reported having consumed a 710-mL ED can.

The reasons and context for ED-use and non-use are shown in Figure 1.

Table 1 Participant characteristics and prevalence of energy drink (ED) intake (*n* = 3688)

Characteristic	Count	%
Sex^a		
Female	2032	55.1
Male	1655	44.9
Age, mean (SD)	3688	13.6 (1.5)
Grade		
Grade 7	1023	27.7
Grade 8	865	23.5
Grade 9	732	19.8
Grade 10	605	16.4
Grade 11	290	7.9
Grade 12	173	4.7
School socio-economic status		
High	1854	50.3
Low	1834	49.7
School location		
Metropolitan	2849	77.3
Regional	839	22.7
Has tried an ED		
Yes	1889	51.2
No	1799	48.8
Frequency of ED intake		
Whole sample ^b		
Never	1799	50.6
Rarely/<1 per month	1009	28.4
Monthly	410	11.5
Weekly or more	338	9.5
Lower school (grades 7–8) ^c		
Never	1000	55.2
Rarely/<1 per month	418	23.1
Monthly	205	11.3
Weekly or more	190	10.5
Middle school (grades 9–10) ^d		
Never	614	47.4
Rarely/<1 per month	413	31.9
Monthly	154	11.9
Weekly or more	115	8.9
Upper school (grades 11–12) ^e		
Never	185	41.4
Rarely/<1 per month	178	39.8
Monthly	51	11.4
Weekly or more	33	7.4
Males^f		
Never	707	44.4
Rarely/<1 per month	469	29.4
Monthly	221	13.9
Weekly or more	196	12.3
Females^g		
Never	1092	55.7
Rarely/<1 per month	540	27.5
Monthly	189	9.6
Weekly or more	141	7.2
ED 'ever-consumers' (<i>n</i> = 1889)*		
Frequency of ED intake ^b		
Rarely/<1 per month	1009	57.4

Table 1 Continued

Characteristic	Count	%
Monthly	410	23.4
Weekly	302	17.2
Everyday	36	2.0
Age first ED consumed, mean (SD) ^h	1885	(10.73, 2.93)
Largest number of EDs consumed in one day ⁱ		
Don't know	270	15.8
1	788	46.2
2	312	18.3
3	153	9.0
4	64	3.8
5 or more	117	6.9

Missing responses: ^a*n* = 1; ^b*n* = 132; ^c*n* = 75; ^d*n* = 41; ^e*n* = 16; ^f*n* = 62; ^g*n* = 70; ^h*n* = 4; ⁱ*n* = 185.

*Participants were classified as an ED 'ever consumer' if they responded affirmatively to the question, 'Have you ever tried an energy drink, even a few sips?'

Discussion

The present study found a high prevalence of ED intake among Australian adolescents, with half the sample (49.4%) reporting trying an ED and one in 10 (9.5%) drinking them weekly or more. Of those who tried an ED, 19.7% consumed more than two in 1 day and the average age of first ED consumption was 10.7 years. ED intake was more frequent among males and older age groups. These results are consistent with previous Australian⁽⁸⁾ and North American^(9,10) studies, which have reported similar findings in terms of lifetime prevalence among adolescents, initial age of consumption, and gender and age differences, although less than the 68% average lifetime ED prevalence reported in the EFSA study involving 16 European countries⁽⁵⁾.

In terms of reasons for and context of ED use, our results support previous findings that adolescents like the taste of EDs use them to feel more energetic, awake and/or alert, boost sports performance and help them study^(11,12). We also found parents and the home environment were key factors associated with the reasons and context for adolescent ED intake; home was the place EDs were consumed most-often, and one-fifth of ED users reported obtaining EDs from a parent. Conversely, 74% of non-ED users reported they did not drink EDs because they were advised not to by their family. In addition to the home, supermarkets/grocery-stores, friends, petrol (gas) stations and convenience stores were among the most common places adolescents in our sample obtained EDs.

Overall, our results suggest that health promotion programmes aimed at reducing/preventing adolescent ED should: (i) include parent-focused interventions which consider role modelling, access and supply, and communicating health-promotion messages; (ii) promote and

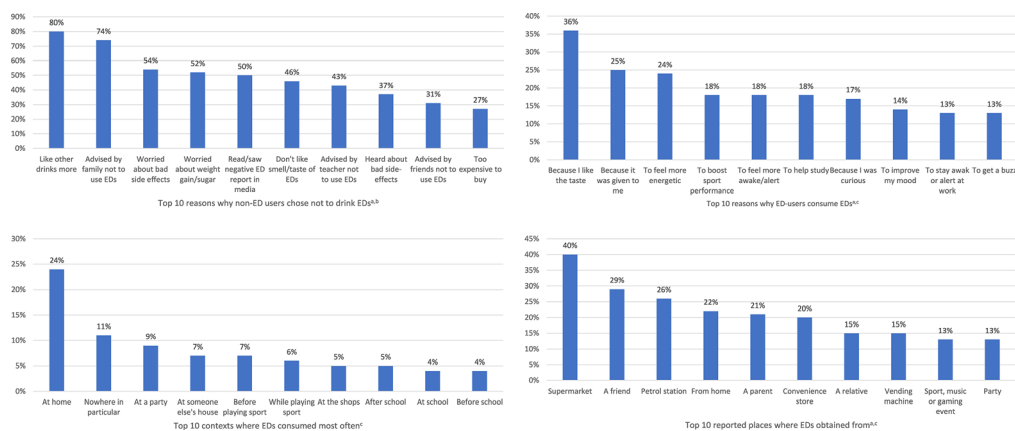


Figure 1 Reasons and context for adolescent energy drink (ED) use and non-use. ED, energy drink. ^aPercentages do not total 100% as respondents could select multiple responses. ^b $n = 1544$ non-ED users (255 missing). ^c $n = 1686$ ED-users (203 missing)

educate young people about alternative (healthy) ways to increase energy levels; (iii) be conducted prior to children turning 10 years, and prior to peak academic stress periods (e.g. exams); and (iv) educate young people about the health dangers associated with consuming EDs when playing sport. Legislative and policy changes including possible licensing of sales (similar to alcohol regulation), may be needed to address adolescents' access to EDs (for a discussion on potential implementation in Australia, see Bromberg & Howard ⁽¹³⁾ 2016). This regulation would decrease the ability and perhaps desire of minors to purchase and consume EDs. Internationally, several countries have banned EDs outright or placed age-related restrictions on sales ⁽¹⁴⁾.

Despite being at risk of selection bias (as a result of active consent) and recall and social desirability bias, the key strengths of the present study include its large sample size (i.e. 3688 adolescents), inclusion of schools with an even representation of school-level socio-economic status (i.e. 50% of participating schools had a high ICSEA score, 50% had a low ICSEA score), inclusion of participants from all secondary school grades (i.e. grades 7 through 12) and inclusion of both metropolitan and regional schools. Furthermore, our sample is broadly representative of the Australian population for this age category. For example, the gender distribution of children 12–17 years in Western Australia is 51% male and 49% female ⁽¹⁵⁾, which is consistent with most Australian states and territories and the national distribution ⁽¹⁶⁾. The geographical distribution of our sample (i.e. 77% metropolitan and 23% regional) is also similar to the 74% metropolitan and 26% regional geographical distribution of all children aged 12–17 years within Western Australia ⁽¹⁵⁾.

In conclusion, the present study contributes to the limited body of international evidence on adolescent ED use and provides valuable information to help ensure future

interventions to reduce/prevent ED consumption and address the underlying reasons and contexts of use.

Transparency Declaration

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with STROBE2 guidelines. The lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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Conflict of interests, source of funding and authorship.

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