

Association of Middle School Students' Consumption of Energy Drinks and Concussions: An Analysis of the Youth Risk Behavior Surveillance System.



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INTRODUCTION

- Energy drink consumption in adolescents has been steadily increasing since the early 2000s.¹
- According to the National Center for Complementary and Integrative Health, almost one-third of teens between the ages of 12 to 17 regularly consume energy drinks.²
- Although energy drinks have been shown to enhance human performance, they are also associated with an increase in risk-taking behaviors which may play a role in the increasing number of children and teens experiencing concussions.³
- Concussions, or mild traumatic brain injury (TBI), is characterized by diffuse axonal injury, which is a primary pathological feature of TBI.³
- Based on a survey from 2019, nearly half of the participating parents worry about their children's risk of concussion.⁴

OBJECTIVES

- Our primary objective was to explore the potential relationship between energy drink consumption and the prevalence of concussions in middle school students.

METHODS

- We conducted a cross-sectional analysis of data from the Youth Risk Behavior Surveillance System (YRBSS) to determine if there was a correlation between energy drink consumption and concussions sustained during physical activity or sports.
- YRBSS is a phone-based interview study of US middle school students from 15 different states.
- We first estimated the prevalence of energy drink consumption, and then performed logistic regression to assess the association, via adjusted odds ratios (AOR), between consuming energy drinks and the likelihood of sustaining a concussion which controlled for age, sex, and ethnoracial categories.

RESULTS

Table 1. Demographics and Energy Drink Consumption

Demographics	0 Energy Drinks	Occasional	At least daily	Total Sample
Age				
11	756 (84.96)	96 (11.04)	35 (4.00)	887 (13.25)
12	1793 (82.08)	289 (13.82)	87 (4.10)	2169 (30.8)
13	1908 (78.86)	358 (14.99)	143 (6.15)	2409 (34.11)
14	1004 (74.96)	220 (17.24)	106 (7.80)	1330 (19.09)
15	126 (66.19)	39 (21.18)	22 (12.63)	187 (2.749)
Sex				
Female	2957 (82.46)	444 (12.65)	167 (4.89)	3568 (48.97)
Male	2620 (76.84)	556 (16.69)	223 (6.47)	3399 (51.03)
Race				
American Indian/ Alaska Native	82 (71.44)	16 (14.91)	15 (13.65)	113 (1.06)
Asian	145 (86.67)	13 (8.698)	7 (4.63)	165 (1.58)
Black or African American	846 (75.09)	180 (16.39)	95 (8.53)	1121 (19.51)
Hispanic/Latino	1516 (79.14)	273 (14.86)	113 (6.00)	1902 (25.82)
Native Hawaiian/ Other Pacific Islander	18 (66.73)	5 (21.74)	2 (11.53)	25 (0.26)
White	2523 (81.97)	427 (13.97)	121 (4.06)	3071 (48.60)
Multiple races	274 (77.3)	57 (17.47)	19 (5.23)	350 (3.170)

- The rate of energy drink consumption increases with the age of the student. Among middle school students who reported drinking at least 1 energy drink per week, 15-year-olds had the highest rate of energy drink consumption at 32.6% (n=187), followed by 14-year-olds at 24.5% (n=1330), 13-year-olds at 20.79% (n=2049), 12-year-olds at 17.3% (n=2169), and 11-year-olds at 14.7% (n=887).
- A higher percentage (22.9%, n=3399) of male students consumed at least 1 energy drink per week compared to female students (17.1%, n=3568).
- Among different races/ethnicities, students classified as American Indian/Alaska Native had the highest percentage of energy drink consumption at 28.66% (n=113), followed by Black or African American at 24.91% (n=1121), Multiple Race at 22.7% (n=350), Hispanic/Latino at 20.86% (n=1902), White at 18.03% (n=3071), and Asians at 13.3% (n=165). Native Hawaiian/Other Pacific Islanders were excluded from the study due to the low sample size (n=25).

Table 2. Associations Between Sustaining a Concussion and Energy Drinks Consumption

	With concussions No. (%)	Adjusted model AOR (95%CI)
Energy Drink in past 7 days		
No	150 (12.29)	1 (Reference)
Yes	42 (21.68)	2.03 (1.36-3.04)
Age		
11	30 (19.3)	1 (Reference)
12	61 (13)	0.66 (0.38-1.16)
13	61 (11.88)	0.55 (0.3-1.01)
14	34 (13.31)	0.69 (0.37-1.29)
15	6 (20.49)	1.23 (0.21-7.18)
Sex		
Female	90 (11.94)	1 (Reference)
Male	102 (15.28)	1.33 (0.94-1.87)
Race		
American Indian/ Alaska Native	6 (19.81)	1 (Reference)
Asian	3 (11.25)	0.77 (0.09-6.69)
Black or African American	27 (23.93)	1.59 (0.52-4.85)
Hispanic/Latino	16 (15.88)	0.92 (0.23-3.72)
Native Hawaiian/ Other Pacific Islander	-	-
White	113 (11.8)	0.68 (0.24-1.91)
Multiple races	18 (19.01)	1.16 (0.35-3.83)

- Among the individuals who did not report consuming energy drinks, 12.29% (n=150) experienced a concussion, which was significantly lower than the 21.68% (n=42) of individuals that did report a concussion alongside energy drink consumption (AOR 2.03, 95%CI 1.36-3.04). There were no significant changes between age, sex, or racial groups.



DISCUSSION

- Our findings suggest that middle school students who consume energy drinks at least occasionally are more likely to sustain a concussion than those who do not—aligning with other similar research investigating performance-enhancing agents and concussions.
- This highlights the importance of further investigating the potential risks associated with energy drink consumption in adolescents and taking appropriate measures to promote safer habits among this age group.

CLINICAL IMPLICATIONS

- Individuals who regularly consume energy drinks have been shown to have significantly higher systolic blood pressure, putting them at risk for cardiovascular complications.
- TBI can result in both short- and long-term consequences in the development of neurological disease.

RECOMMENDATIONS

- New regulations on energy drinks are recommended, as the current FDA guidelines on caffeine content within beverages were established in 1958, which are outdated.⁵
- Based on our findings, and the additional TBI recovery issues arising from energy drink consumption, we also recommend these coaches be aware of these risks and address them with players

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