Short Communication

Energy drink consumption and substance use risk in middle school students

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ABSTRACT

Objectives. Energy drink (ED) sales have increased greatly in recent years and ED is now a common topic in health behavior research. Most studies work with samples of college students and/or young adults and to a lesser degree with high school students. Research is lacking on ED consumption in younger users. The purpose of this study was to fill this gap and assess the prevalence of ED consumption in a sample of middle school students as well to analyze the relationships between ED use and illicit and licit drug use in girls and boys of this age.

Method. We use cross-sectional school-survey data from 6–8th grade students in three US mid-Atlantic schools conducted in September to November 2014 (N = 1152, response rate: 82.4%).

Results. Approximately 20% of participants had consumed ED and 10% had smoked cigarettes. Almost 14% had used alcohol at least once in their lifetime and 5.5% marijuana. Boys were more likely than girls to have used ED but no gender difference was observed in the prevalence of illicit substances. However, ED use was positively related to smoking and alcohol use among both genders, but also to several forms of illicit drug use among girls.

Conclusion. ED consuming girls are particularly prone to also use illicit substances. This is the first survey-type study which reports a positive relationship between ED consumption with both licit and illicit drug use in middle school-aged girls and boys.

1. Introduction

The sales of energy drinks (EDs) have increased greatly in recent years (Pomeranz, 2012). A signal of this increase is a surge in hospital emergency department cases of young people consuming excessive amounts of energy drinks (Cotter et al., 2013). ED contains caffeine in concentrations similar to that of regular coffee or between 70 and 130 mg of caffeine per 12 oz (Heckman et al., 2010). Studies have shown that around 70% of high-school aged adolescents consume ED regularly and as many as 20% use them every day or most days (James et al., 2011; Kristjansson et al., 2013a). In extant adolescent health literature on ED, most attention has been devoted to the relationship between ED and alcohol use, particularly the consumption of alcohol mixed with ED (AmED) (e.g., Azagba et al., 2014; Azagba and Sharaf, 2014). This line of research has shown a strong relationship between AmED, heavy drinking and increased odds of alcohol dependence (Marczinski et al., 2013). Additionally, adolescent ED literature has reported associations between ED use and increased odds of sexual risk behaviors (Snipes and Benotsch, 2013), injuries (Hamilton et al., 2013), poorer academic outcomes (James et al., 2011), violent

behaviors and conduct disorders (Kristjansson et al., 2013a), and licit and illicit drug use (Arria et al., 2010), to name a few.

However, in the current adolescent ED paradigm studies have been conducted almost exclusively with samples of young adults (e.g., Snipes and Benotsch, 2013), college students (e.g., Woolsey et al., 2015), and less commonly with high-school aged youth (e.g., Kristjansson et al., 2015). Although review studies on caffeine have highlighted ED's potential for harm in younger populations (e.g, Temple, 2009; Schneider et al., 2011), very little research has been conducted with younger participants including those of middle school age. Notable exceptions are Kristjansson et al. (2014) which found a positive relationship between consumption of ED and other caffeine containing soft drinks and several forms of physical complaints in 10–12 years old children, Luebbe and Bell (2009) which discovered a relationship between caffeine use in 5th graders and increased risks for withdrawal-related anxiety and depressive affect, and Miyake and Marmorstein (2015) that found a positive longitudinal relationship between ED use and alcohol use 16 months later using a small sample of 7th and 8th grade students from a single school. Although a relationship has been established between ED consumption and substance use in older adolescents, no large-scale study has identified such a relationship in middle school-aged children to date.

Further, recent evidence has highlighted some important gender differences with regard to patterns of consumption of caffeinated products and its relations to behaviors among children and youth

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(Temple et al., 2010; James et al., 2015). Some of this literature has shown that girls may be more prone to conduct problems in combination with their caffeine consumption from ED (Kristjansson et al., 2011; Kristjansson et al., 2013a). Nevertheless, as with other published studies in the area of ED and caffeine use among youth, this literature has operated with samples of high school students, college students, and/or young adults. Thus, the two objectives of this study were to 1) assess the relationship between ED use and alcohol, tobacco and other drug use (ATOD) in middle school children, and 2) test for gender differences in both the prevalence of ED use as well as the relationships between ED use and ATOD while employing a large sample of middle school girls and boys.

2. Method

2.1. Sample and procedures

Data for this study were collected as part of the Integrated Community Engagement (ICE) Collaborative in West Virginia. ICE is an ongoing health promotion effort that uses school-survey data to inform stakeholders about risk and protective factors for substance use. Upon passive parental consent (all children were included in the study unless their parents/caregivers opted them out), survey data was collected by teachers under the supervision of a school contact agent that operated as a liaison to the research team. All accessible students in grades 6–8 in three mid-Atlantic middle schools participated in the study (N = 1152. Response rate 82.4%). The study was reviewed and approved by West Virginia University's IRB (protocol # 1406345394). For additional methodological details, this data collection approach and process has been described previously by Kristjansson et al. (2013b).

2.2. Measures

The question on ED use was created by the research team for this study but based on Kristjansson et al. (2013a, 2013b, 2015). The substance use questions in the ICE project have been largely adopted from national and international studies, specifically the Monitoring the Future survey in the US (Johnston et al., 2014) and the European School Project on Alcohol and other Drugs (Hibell et al., 2012).

2.2.1. Energy drinks (EDs)

ED use was assessed with the question "During the past 7 days how many times did you drink a can, bottle, or glass of caffeinated energy drinks such as Monster, Red Bull, XL, Full Throttle, or Rock Star?" Response categories ranged from 1 = "I did not drink caffeinated energy drinks during the past 7 days" to 7 = "4 or more times per day". For the present analyses this variable was dichotomized with 0 = "not used ED in past 7 days" and 1 = "used ED 1+ times in past 7 days".

2.2.2. Smoking

Tobacco smoking was assessed with the following two questions: 1) "Have you ever tried cigarette smoking, even just one or two puffs? Response categories were 1 = "yes" and 2 = "no". 2) "During the past 12 months, how often have you smoked cigarettes?" Response categories ranged from 1 = "never", to 7 = "40 times or more often". This variable was also dichotomized with 0 = "never" and 1 = "ever".

2.2.3. Alcohol use

Alcohol consumption was assessed with the following three questions: 1) "Have you ever had a drink of alcohol, other than a few sips?", 2) "Have you ever been drunk from drinking alcohol?" Response categories for 1 and 2 were 1 = "yes" and 2 = "no". 3) "During the last 12 months, how often have you had a drink of alcohol (including; beer, wine, wine coolers, and liquor such as rum, gin, vodka, or whiskey) other than a few sips?" Response categories were the same as for 12 month cigarette smoking and were dichotomized with 0 = "never" and 1 = "ever".

2.2.4. Other drug use

The use of other drugs was assessed with 5 questions that were headed with "In your lifetime, have you ever used the following drugs or substances?" and the questions were 1) "Marijuana (also called weed or pot) or Hashish (also called hash or hash oil)?", 2) "Sniffed glue, breathed the content of spray cans, or inhaled any paints or sprays to get high?", 3) "Taken a prescription drug (such as OxyContin, Percocet, Vicodin, Codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?", 4) "Synthetic marijuana (also known as K2 or spice) to get high?", and 5) "'Bath Salts' (synthetic stimulants) to get high?" Response categories were coded with 1 = "yes" and 2 = "no".

2.2.5. Control variables

Four control variables were used in the present analyses. 1) "Family structure", coded 1 = "lives with both parents" and 2 = "other forms". 2) "Race/ethnicity", coded 1 = "white" and 2 = "other". 3) Separate questions were asked for the highest educational levels of mothers and fathers. Response categories ranged from 1 = "elementary or middle level education or less" to "a graduate degree".

2.3. Analyses

Bivariate analyses for this report were conducted with Chi-Square tests. Multivariable analyses were done using logistic regression for categorical data with separate models run for boys and girls for each outcome variable. Within each outcome variable gender difference in the relationship between ED and the outcome was tested with a mean-centered ED*Gender variable while also including gender in the respective model.

Table 1
Frequencies and descriptive statistics for all study variables (95% CI) (N = 1130).

Variables	Boys %	Girls %	Total %	P value for gender diff.
Energy drinks	25.2 (21.5–29.3)	15.6 (12.7–19.0)	20.3 (17.9–22.9)	.001
Ever smoking	12.0 (9.5–15.2)	7.8 (5.8–10.4)	9.8 (8.2–11.8)	.023
Smoking in last 12 months	5.4 (3.7–7.7)	3.3 (2.1–5.2)	4.3 (3.2–5.7)	.110
Ever alcohol	15.8 (12.9–19.4)	12.1 (9.6–15.1)	13.9 (11.9–16.1)	.080
Alcohol in last 12 months	12.0 (9.5–15.2)	8.6 (6.5–11.2)	10.2 (8.5–12.2)	.067
Ever drunkenness	3.0 (1.9–5.0)	3.2 (2.0–5.0)	3.1 (2.2–4.4)	.892
Ever marijuana	6.5 (4.6–9.0)	4.67 (3.1–6.7)	5.5 (4.2–7.1)	.191
Ever inhalants	3.9 (2.5–6.1)	4.8 (3.3–7.0)	4.4 (3.3–5.8)	.516
Ever prescription medication	3.7 (2.4–5.8)	3.6 (2.3–5.6)	3.7 (2.7–5.0)	.918
Ever synthetic marijuana	3.4 (2.1–5.4)	3.1 (1.9–4.9)	3.2 (2.3–4.5)	.787
Ever bath salts	2.5 (1.4–4.3)	2.5 (1.5–4.2)	2.5 (1.7–3.7)	.985
Lives with both parents	64.6 (60.5–68.4)	57.9 (53.8–61.9)	61.2 (58.3–64.0)	.022
White	79.2 (75.6–82.4)	82.0 (78.7–85.0)	80.7 (78.2–82.9)	.237
Mothers education (X, SD)	2.56 (2.20)	2.94 (2.40)	2.75 (2.31)	.009
Fathers education (X, SD)	2.79 (2.45)	2.92 (2.56)	2.86 (2.50)	.390