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The temporal association between energy drink and alcohol use among adolescents: A short communication

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Abstract

Purpose—To investigate the temporal relation between energy drink and alcohol use among adolescents.

Methods—Data were collected from adolescents attending public high schools in two waves ($n = 894$).

Results—Path analysis indicated that energy drink use at baseline was positively associated with the number of drinking days but not binge drinking or average drinks per drinking day over the past 30 days at follow-up. This relation remained while controlling for race, age, gender, previous alcohol use, and impulsivity.

Conclusions—Alcohol use prevention efforts should consider energy drink use as risk factors for adolescent alcohol use.

Keywords

Energy drink use; Alcohol use; Adolescents; Longitudinal

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Contributors

HJC conceived the study, performed the statistical analysis, interpreted the data and drafted the manuscript. CW, MJB, and JE drafted the manuscript. GLS critically revised the manuscript. KEP and JRT conceived the study design, interpreted the data, and critically revised the manuscript.

All authors have read and approve the submission of this paper to *Drug and Alcohol Dependence*.

Conflict of interest statement

All authors have no conflicts of interest relevant to this article to disclose.

1. Introduction

Adolescent alcohol use is a substantial public health concern in the US (Swendsen et al., 2012), as it corresponds to an increased risk for alcohol problems in adulthood (Guttmanova et al., 2011). Energy drink use, or consumption of beverages containing a combination of caffeine, stimulants, and other energy-enhancing ingredients (e.g., B-vitamins, guarana, and taurine), may contribute to adolescents' risk for alcohol use (Arria et al., 2014; Emond et al., 2014). Approximately two-thirds of adolescents in the US report past-year energy drink use (Azagba et al., 2014), and several studies have demonstrated cross-sectional relations between energy drink and alcohol use among adolescents and college students (Arria et al., 2014, 2011; Azagba et al., 2014; Emond et al., 2014). However, only one longitudinal study with 144 middle school students has examined this association, demonstrating that energy drink use predicts alcohol use 16 months later and that this association was partially explained by parental monitoring, but not sensation-seeking (Miyake and Marmorstein, 2015). Additional prospective research conducted on older adolescents (i.e., high school students), who may be at greater risk for alcohol use, is critical to inform intervention and prevention programming. Further, additional prospective research that includes potential third variables, such as past alcohol use, demographic characteristics, and impulsivity will further indicate whether energy drink use is a behavior to target to reduce risk for alcohol use. Thus, we examine the temporal relation between energy drink and alcohol use in adolescents while controlling for these additional risk factors.

2. Methods

2.1. Procedure and participants

Data are from an ongoing longitudinal study of adolescent health (Temple et al., 2013). The baseline and follow-up data were collected in Spring, 2012 ($n = 894$) and Spring, 2013 ($n = 780$; retention rate: 87.2%), respectively.

Study recruitment occurred during school hours. Active parental permission and student assent were obtained, and students received a \$10 gift card for each assessment. For students still in school, self-administered questionnaires were completed via paper-pencil format during class time. Remaining students completed the surveys through a mixed-mode approach (web surveys and web prompting, telephone interviews, and paper-pencil surveys at convenient locations). The study was approved by the Institutional Review Board of the last author's institution. At baseline, almost 56% of the participants were female with a mean age of 17.04 ($SD = 0.77$). Approximately 75% of the participants were in the 11th grade with the remaining in 12th grade. Racial/ethnic background was as follows: African American (27%), White (30%), Hispanic (32%), and other (11%).

2.2. Measurements

2.2.1. Outcomes (follow-up)—The following three outcome variables regarding alcohol use were measured: (1) “On average, how many drinks do you have per drinking occasion? (Please keep in mind that a beer, glass of wine, and shot of liquor each equal 1 drink)”

Responses were categorized on a 5-point scale anchored by 0 (0 drinks) and 4 (more than 8 drinks). (2) “During the past 30 days, on how many days did you have at least one drink of alcohol?” Responses were categorized on a 5-point scale anchored by 0 (0 days) and 4 (more than 8 days). (3) After defining binge drinking (5 or more drinks for boys, 4 or more drinks for girls), adolescents were asked, “In the past month, how many days would you say you participated in binge drinking?”. Because of positive skew, we dichotomized responses to this question as yes/no on whether or not adolescents participated in binge drinking in the past month.

2.2.2. Energy drink use (baseline)—Using a 6-point scale anchored by 0 (0 days) and 5 (21–30 days), participants responded to the following question, “In the past 30 days, on how many days have you consumed energy drinks (Red Bull, Monster, Full Throttle, etc. Do not include energy shots like 5 Hour Energy)?”

2.2.3. Covariates (baseline)—Gender (female = 1 vs. male = 0), age, ethnicity (three-dummy-coded variables: Hispanic = 1 vs. Non-Hispanic = 0/White = 1 vs. Non-White = 0/Black = 1 vs. Non-Black = 0), parental education (1 = did not graduate from high school and 4 = finish college; using highest degreed parent), average drinks per drinking day in the past month, number of drinking days in the past month, past month binge drinking (No = 0 vs. Yes = 1), and impulsivity, as measured with the 4-item Impulsiveness Scale from the Teen Conflict Survey ($M = 2.33$, $SD = 0.87$, $\alpha = 0.74$; Bosworth and Espelage, 1995) were included in the path model as control variables.

2.3. Statistical analysis

We used a path model in Mplus 7.11 (Muthen and Muthen, 2013) to investigate the temporal association between past-month energy drink use and past-month alcohol use in the following year controlling for demographics, impulsivity, and previous alcohol use. We do not report model fit indices because the model is a fully saturated model, which examines all possible relationships and provides perfect model fit indices by definition. Because outcome variables were either ordered categorical (i.e., number of drinking days and average drinks per drinking day), or a binary variable (i.e., binge drinking), weighted least squares with mean- and variance- adjusted parameter estimates method was used (Flora and Curran, 2004). Full information maximum likelihood method was employed to deal with missingness (Graham et al., 2003).

3. Results

Table 1 presents frequencies, means (SD), and correlations between energy drink use and alcohol use. Energy drink use in the past month was positively related with alcohol use in the past month. After controlling for alcohol use at baseline, the effect size of energy drink on alcohol use in the past month decreased or became nonsignificant compared with the correlations (see Fig. 1). Findings were partially consistent with our hypothesis. Energy drink use at baseline predicted number of drinking days, but not past month binge drinking or average drinks per drinking day, at follow-up.

4. Discussion

The current study is among the first longitudinal studies to examine the association between energy drink and alcohol use among adolescents. Our findings with late adolescents were consistent with a study on younger adolescents (Miyake and Marmorstein, 2015) but were inconsistent with a cross-sectional study with young adults regarding binge drinking (Velazquez et al., 2012). This indicates that frequency of energy drink use is a common risk factor for alcohol use. Yet, empirical questions remain regarding the point at which energy drink use transitions into binge drinking. Additional third variables should be explored, such as peer influence or psychiatric symptoms. Further, future work should investigate the impact of energy drink use co-occurring with alcohol use (i.e., mixing energy drinks with alcohol) on later alcohol problems. Such research will inform whether prevention and intervention efforts should focus on reducing energy drink use or rather target individual or social variables that underly the association between energy drink use and alcohol use in later life. This study supports energy drink use as a risk factor for later alcohol use. Prevention and intervention efforts should target energy drink use to potentially reduce risk for alcohol abuse and dependence in adolescents.

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Fig. 1.

The temporal relationship between energy drink use and risky alcohol use. *Note.* Each variable regarding alcohol and energy drink use were past-month usages. Path coefficients and correlations are completely standardized. Although not shown here, gender, age, parental education, ethnicity and impulsivity at baseline were included as covariates in the model. All significant ($p < 0.05$) paths are highlighted by boldface.

Table 1

Correlations among energy drink use and alcohol use.

	Frequency [§] (%) / Mean (SD)	3	4	5	6	7
1. Past month binge drinking (baseline)	230 (29.87)					
2. Past month binge drinking (follow-up)	230 (40.49)					
3. Energy drink use	0.58 (1.03)	–				
4. Past month number of days drinking alcohol (baseline)	1.07 (1.41)	0.32***	–			
5. Past month average drinks per drinking day (baseline)	1.46 (1.47)	0.27***	0.73***	–		
6. Past month number of days drinking alcohol (follow-up)	1.29 (1.48)	0.27***	0.57***	0.52***	–	
7. Past month average drinks per drinking day (follow-up)	1.66 (1.44)	0.22***	0.50***	0.57***	0.70***	–

[§]The number of binge drinkers was shown.

 $p < 0.001$.