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Driving under the influence behaviours among high school students who mix alcohol with energy drinks

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ABSTRACT

Alcohol and energy drinks are commonly used substances by youth in Canada, and are often mixed (AmED). While several studies have shown that AmED can have dangerous effects, less well understood is how AmED is associated with driving under the influence of either alcohol or drugs. This study sought to determine whether youth who use AmED were more likely to engage in driving, or being a passenger of a driver, under the influence of alcohol or cannabis compared to youth who use either alcohol or energy drinks alone.

This study used data from grade 10–12 students who took part in the 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey (N = 17,450). The association of past-year AmED use with past-30 day: driving under the influence of alcohol or cannabis, and riding with an alcohol- or cannabis-influenced driver, was assessed using logistic regression.

One in four youth had consumed AmED in the previous 12 months. AmED users were more likely to engage in all risk behaviours except riding with a drinking driver, relative to youth who only consumed alcohol. No association was observed for youth who consumed alcohol and energy drinks on separate occasions.

Youth who use AmED demonstrate a higher risk profile for driving under the influence of alcohol or cannabis, than youth who use alcohol alone. Future research should explore the biopsychosocial pathways that may explain why using energy drinks enhances the already heightened risk posed by alcohol on other health-related behaviours such as driving under the influence.

1. Introduction

The term “energy drink” encompasses a variety of beverages with purported stimulant effects such as enhanced alertness and increased energy (Khan et al., 2016). These beverages are primarily composed of caffeine and sugars, and may include other ingredients such as L-carnitine, guarana, L-arginine, and taurine (McGuinness, 2011). The U.S. Food and Drug Administration does not require that energy drink manufacturers label beverage containers with the amount of caffeine in each beverage (U.S. Food and Drug Administration, 2017). While caffeine levels in cola-type beverages are regulated to not exceed 0.02% (approximately 5.9 mg/oz), energy drinks sold in the United States are not strictly regulated, and have a wide range of caffeine contents from 1.5–32.5 mg/oz (Rosenfeld et al., 2014). According to Health Canada

regulations, energy drinks cannot contain more than 180 mg of caffeine per 500 mL serving (10.6 mg/oz), and containers must display a warning of high caffeine content and a recommended maximum daily serving (Health Canada: Food Directorate - Health Products and Food Branch, 2013). Throughout North America, energy drinks are sold under a variety of different brand names, are easily available in grocery stores and gas stations, and are heavily marketed to youth (Harris et al., 2011; Emond et al., 2015; Costa et al., 2014). Reid et al., (2017a) found that 1 in 6 adolescents who consumed energy drinks had exceeded the usual guidance for maximum daily consumption. The use of energy drinks has risen steadily in the past decade, with around 30% of both American and Canadian junior and senior high school students reporting energy drink use (Government of Canada, 2016; Terry-McElrath et al., 2014).

Abbreviations: AmED, alcohol mixed with energy drinks; CSTADS, Canadian Student Tobacco Alcohol and Drugs Survey; DUIA, driving under the influence of alcohol; DUIC, driving under the influence of cannabis; RWDD, riding with a drunk driver; RWCD, riding with a cannabis-using driver; CMA, census metropolitan area; CA, census agglomerations

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Alcohol is the most commonly used substance by youth in North America, with around 75% of grade 12 students in both Canada and the United States reporting any alcohol consumption (Centers for Disease Control and Prevention, 2014; Asbridge and Langille, 2013). Despite warnings to the contrary, some young people consume alcohol mixed with energy drinks (AmED) (Reissig et al., 2009). While mixing alcohol with caffeinated beverages is not a new phenomenon (e.g. rum and cola), AmED use is particularly concerning due to high levels of caffeine and other plant-based stimulants (Centers for Disease Control and Prevention, 2017). Compared to using alcohol alone, several dangerous effects have been documented in relation to AmED use, including increased motivation to drink (Marczinski and Fillmore, 2014), reduced perception of motor control impairment (Ferreira et al., 2006), and reduced self-perceived levels of intoxication (Ferreira et al., 2006). Several studies have examined motivations for mixing alcohol with energy drinks among youth. While some reported motivations were unrelated to the purported effects of AmED, such as simply liking the taste (Verster et al., 2014), others consumed AmED to slow the onset of intoxication (Marczinski, 2011), to reduce the sedative effects of alcohol (Marczinski, 2011), to increase their ability to consume more alcohol (Pennay and Lubman, 2012), to increase sociability (Pennay and Lubman, 2012), and to sober up more quickly (Woolsey et al., 2010). The last motivation is particularly relevant for youth across North America, where many jurisdictions have a zero-tolerance policy for driving under the influence alcohol or drugs among young and novice drivers as part of their graduated drivers licensing programs (Asbridge et al., 2016; Royal Canadian Mounted Police, 2016). In Canada, for instance, a young person can obtain a learners permit at age 16 and will be under these restrictions until age 21. The consumption of energy drinks could mistakenly be viewed as a means to more quickly reduce blood alcohol concentration, or drug use biomarkers, in order to drive (Woolsey et al., 2010).

Correlates of AmED use among youth have been well documented and include: increasing age, smoking, binge drinking, cannabis use, participation in school sport, having more spending money, school truancy, lower school connectedness, and lower academic average (Khan et al., 2016; Reid et al., 2017a; Azagba et al., 2013; Martz et al., 2015). A growing body of literature has also found that AmED use is associated with increased risk-taking behaviours, injury, and harm (Roemer and Stockwell, 2017), such as heavy binge drinking (Woolsey et al., 2010), alcohol dependence (Snipes et al., 2015), more instances of negative alcohol-related consequences (de Haan et al., 2012; Patrick and Maggs, 2014), sexual risk taking (Miller, 2012), and drinking and driving behaviours (Woolsey et al., 2015); however, these studies are largely concentrated among American college students. One study of Dutch university students found that compared to those who consumed alcohol only, AmED was associated with lower odds of past-year consequences such as drinking and driving and alcohol-related injury, indicating the potential for variation in this association by geographic region (de Haan et al., 2012).

Given the disconnect between perceived level of intoxication and actual behavioural impairment among AmED users compared to alcohol-only users, driving under the influence is a risk behaviour of interest (Woolsey et al., 2015). Motor vehicle collisions produce substantial financial, healthcare, and social costs, with more than half of fatal collisions in Canada in 2012 involving a driver under the influence (MADD Canada, 2012a; MADD Canada, 2012b). There is significant interest in determining correlates of impaired driving in order to develop targeted prevention strategies (Chen et al., 2008; McDonald et al., 2014). Three studies have looked at high school students in the United States, and all found that AmED users were more likely to report unsafe drinking and driving behaviours (Martz et al., 2015; Tucker et al., 2016; Williams et al., 2017). However, the associations of AmED with other risky driving-related activities, including being a passenger of an alcohol or cannabis-influenced driver and driving under the influence of cannabis have yet to be investigated among high school students.

Patterns of AmED use and associated harm may differ by country, and between high school students and college students due to differing substance using cultures in these settings (Tse and Tse, 2011; Bingham et al., 2005). Furthermore, driving under the influence of cannabis has equalled, and in some cases, surpassed rates of drinking and driving among high school students in many jurisdictions in recent years (O'Malley and Johnston, 2013).

The pathway by which AmED may be linked to driving under the influence is complex. The literature around injury and AmED use suggests that risk-taking tendencies may play an important role (Roemer and Stockwell, 2017). Berger et al. (2014) found that AmED use was associated with an increased engagement in high risk-taking activities, and O'Brien et al. (2013) noted that injury requiring medical treatment was associated with AmED use among college students, but that sensation-seeking moderated this outcome. The current state of the evidence leads to an important question: is it the direct effects of AmED consumption that produce risk-taking behaviours and associated adverse outcomes, or do AmED users have a higher risk behavioural profile compared to non-drinkers, those who only consume alcohol, those who only consume energy drinks, or those who use alcohol and energy drinks separately on different occasions? This study seeks to determine the associations of AmED with driving under the influence behaviours among a previously uninvestigated population: Canadian high school students. With the inclusion of driving under the influence and riding with a driver under the influence as potential outcomes, we aim to investigate propagating risk, and taking risks. Similarly, by examining alcohol- and cannabis-related driving behaviours, we seek to investigate risks that are directly and indirectly related to alcohol use.

2. Methods

2.1. Study design

The Canadian Student, Tobacco, Alcohol, and Drugs Survey (CSTADS) is a biennial self-reported paper-based survey administered to students in public, private, and Catholic schools across Canada (Propel Centre for Population Impact: University of Waterloo, n.d.). A total sample of 42,094 students in grades 6 to 12 completed the survey, with data collection between October 2014 and May 2015 in all Canadian provinces (territories were not included) (Reid et al., 2017b). This equated to a total of 128 school boards (49% participation rate), and 336 schools (47% participation rate) (Minaker et al., 2017).

The original survey employed a stratified single stage cluster design, with strata based on health region smoking rate and type of school (elementary and high school), and schools randomly selected within each stratum. A generalizable sample was achieved in all provinces with the exception of New Brunswick, due to a low response rate (Reid et al., 2017b).

CSTADS received ethical approval from the Health Canada Research Ethics Board, the Office of Research Ethics at the University of Waterloo, and from school boards and affiliated institutional ethics review boards in each province (Propel Centre for Population Impact: University of Waterloo, n.d.).

2.2. Study sample

This study draws upon data from grades 10–12 students, as most students in grades 6–9 were not old enough to operate most motor vehicles in any province. This represented a total of 17,450 students. Data for students from New Brunswick were included in overall estimates, but were not reported separately in provincial estimates due to restrictions for small cell sizes as established in research ethics applications.

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