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Energy drink use frequency among an international sample of people who use drugs: Associations with other substance use and well-being

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ABSTRACT

Objective: The study aims were to identify: i.) energy drink (ED), caffeine tablet, and caffeine intranasal spray use amongst a sample who report drug use, and ii.) the association between ED use frequency and demographic profile, drug use, hazardous drinking, and wellbeing.
Method: Participants (n = 74,864) who reported drug use completed the online 2014 Global Drug Survey. They provided data on demographics, ED use, and alcohol and drug use, completed the Alcohol Use Disorders Identification Test (AUDIT) and Personal Wellbeing Index (PWI), and reported whether they wished to reduce alcohol use.
Results: Lifetime ED, caffeine tablet and intranasal caffeine spray use were reported by 69.2%, 24.5% and 4.9%. Median age of ED initiation was 16 years. For those aged 16–37, median years using EDs increased from 4 to 17 years of consumption, where it declined thereafter. Greater ED use frequency was associated with: being male; under 21 years of age; studying; and past year caffeine tablet/intranasal spray, tobacco, cannabis, amphetamine, MDMA, and cocaine use. Past year, infrequent (1–4 days) and frequent (≥5 days) past month ED consumers reported higher AUDIT scores and lower PWI scores than lifetime abstainers; past month consumers were less likely to report a desire to reduce alcohol use.
Conclusions: ED use is part of a complex interplay of drug use, alcohol problems, and poorer personal well-being, and ED use frequency may be a flag for current/future problems. Prospective research is required exploring where ED use fits within the trajectory of other alcohol and drug use.

1. Introduction

Caffeinated energy drinks (EDs) are stimulant beverages marketed to facilitate performance by reversing fatigue effects and increasing alertness (Heckman et al., 2010). EDs attained popularity following the formation of the Red Bull® brand in Austria in 1987, and the release of their product in the United States in 1997 (Reissig et al., 2009). Estimates of use are generally based on convenience samples within specific regions in the United States, Canada, Australia and Europe, with indications that consumption is normative amongst adolescents (Arria et al., 2014; Azagba et al., 2014; Gallimberti et al., 2013) and young adults (Arria et al., 2010; Berger et al., 2011; Lubman et al., 2013; Rudolph et al., 2014). However, increasing adverse exposure presentations to emergency departments and poison information call centres (Gunja and Brown, 2012; Substance Abuse and Mental Health Service Administration, 2011, 2013), coupled with associations between consumption and risky behaviour (Arria et al., 2014), have generated public debate regarding whether regulation of these beverages would be appropriate.

In regards to risky behaviour, research has indicated that ED consumption is associated with increased alcohol consumption (e.g., Arria et al., 2010, 2011), tobacco consumption (e.g., Friis et al., 2014; Trapp et al., 2014b), nonmedical use of prescription drugs (e.g., Arria et al., 2010; Miller and Quigley, 2011), and illicit drug use (e.g., Terry-McElrath et al., 2014; Trapp et al., 2014b). Based on the pharmacological effects of ED and of alcohol, it has been hypothesised that simultaneous use of EDs with alcohol may promote increased alcohol intake by: i.) delaying onset of fatigue/offsetting the sedating effects of alcohol, ii.) reducing perception of intoxication, iii.) exacerbating disinhibiting effects of alcohol, and iv.) masking the taste of alcohol making consumption more

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pleasurable. Recent reviews provide mixed support for these assumptions, with consistent evidence of enhanced stimulation and priming effects (i.e., increased desire for more alcohol), but conflicting findings regarding decreased perception of intoxication (McKetin et al., 2015; Peacock et al., 2014). However, not all consumers of EDs co-ingest, or even use, alcohol (Lubman et al., 2013), meaning that we need to look more broadly for explanations of the association between ED and alcohol and other drug use. Alternative explanations include: i.) common genetic, psychosocial and cultural risk factors which predispose caffeinated ED, alcohol and drug use (Arria et al., 2011; Kendler et al., 2006), ii.) ED marketing promoting the psychoactive effects of the beverage (Reissig et al., 2009), and iii.) caffeinated ED consumption resulting in 'cross-sensitisation' whereby the dopamine system is primed to respond in a rewarding and reinforcing manner to alcohol and other stimulant drugs (Arria et al., 2014; Ferré, 2013; Temple, 2009).

Several of these potential explanations are based on the premise of a dose-response relationship, whereby increased frequency of ED intake inflates risk of reporting hazardous alcohol use and using other drugs. However, few of the aforementioned studies have studied the link between the frequency of ED use and degree of alcohol and drug-related problems. Arria et al. (2011) found that high frequency ED consumers (≥52 days of use in the past year) were more likely to meet alcohol dependence criteria than low-frequency ED consumers (≤51 days) and Velazquez and colleagues (Velazquez et al., 2012) showed that a one day increase in past month ED use was associated with an increased risk of heavier drinking by 80%. Whilst providing a strong basis to suggest that higher frequency ED use may be associated with greater problems, these analyses did not take into account the potential continuum in ED consumption frequency from lifetime abstinence to daily use.

The majority of our knowledge regarding ED consumption patterns and associated behaviours stems from research with secondary school and university student samples in the US, Australia and Europe (Arria et al., 2014; Velazquez et al., 2012). Given that market-leading ED brands are reportedly available in over 75% of countries worldwide (Red Bull, 2015), it is critical to explore this relationship on a global level. It is also important to place these products in the context of other non-traditional caffeine products marketed as enhancing energy, such as caffeine tablets and more recently caffeine intranasal sprays and sublingual strips. The latter two forms only available since 2013 offer the possibility of a more rapid onset of action and potentially of more intense effects and more unwanted effects related to peak plasma levels (such as headache and heart palpitations). In this study, we draw on a very large global non-probability sample of people who use drugs, including alcohol. The specific objectives were to:

1. Describe ED, caffeine tablet, and intranasal spray consumption patterns amongst a large international sample who report drug use;
2. Identify the demographic and alcohol and drug use correlates of ED use frequency (from lifetime abstinence to regular use); and
3. Assess whether or not frequency of ED consumption is associated with severity of alcohol problems, desire to reduce alcohol use, and subjective wellbeing.

As aforementioned, previous studies have established the link between frequency of ED consumption and hazardous alcohol use. However, there has been no research exploring whether ED consumers are more or less motivated to change their alcohol use (motivation for change being a predictor of reductions in alcohol use; Adamson et al., 2009). As ED consumers are typically more risky, and experience greater negative consequences (Arria et al., 2010, 2011; Malinauskas et al., 2007), we anticipated findings indicating that heavier ED consumers would be less likely to report motivation to change alcohol use. In line with this, we also extended existing research showing a positive association between ED use and depression and anxiety (Richards and Smith, 2016), anticipating greater frequency of use would be associated with poorer overall wellbeing. By studying hazardous alcohol use, desire to reduce alcohol use, and overall wellbeing, we hoped to determine whether greater frequency of ED use could be a possible flag from a clinical perspective for intervention or treatment.

2. Material and method

2.1. Design

The Global Drug Survey (GDS) runs the world's biggest drug survey, open to all individuals aged 16 years of age or older. Using an anonymous on-line survey hosted on an encrypted server (https://www.globalrugsurvey.com) GDS uses an international network of media partners (such as Huffington Post, Ziet Online, Fairfax Media, The Guardian and Stuff.co.nz) to promote participation in the survey. The media partners act as hubs with onward promotion through social media (such as Twitter, Facebook and Reddit). This methodology (based on a decade of work by this research group; McCambridge et al., 2007; Winstock et al., 2001) allows for the rapid assessment and identification of alcohol, licit and illicit drugs based on monitoring of large sentinel sample of people who use drugs. Discussion of methods (utility, validity and limitations) has been published elsewhere (Bellis et al., 2015; McCambridge et al., 2007; Winstock et al., 2001, 2011). Ethical approval was received from the Joint South London and Maudsley and Institute of Psychiatry NHS Research Ethics Committee. In this study, data from the GDS 2014 (open between November 11 and December 29, 2013) was examined.

2.2. Measures

The survey offers a drugs screen that allows subsequent sections of the survey to be tailored based on the individual's recent drug use experience. For all substances including EDs, participants reported lifetime, past year and past month use, days of use in the past month, and age of initiation. In addition to demographics (age, sex, current paid employment, whether they were currently studying any qualification, and country of origin), participants were asked about their use of alcohol, tobacco, cannabis, 3,4-methylenedioxymethamphetamine (MDMA), amphetamines (excluding MDMA), and cocaine, as well as over 140 other drugs. The 10-item Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001) was administered as a measure of alcohol consumption; higher scores are indicative of more problematic use (cut-off score of 8 for harmful alcohol use; Babor et al., 2001). Past year alcohol consumers were also asked if they would like to drink less alcohol over the next 12 months (no/yes). The Personal Wellbeing Index (PWI; ranging from 0 to 80) was administered to assess subjective wellbeing; lower scores are indicative of poorer wellbeing (International Wellbeing Group, 2013).

2.3. Data analysis

Data were cleaned to remove cases who did not report any alcohol or licit/illicit drug use in their lifetime, cases which had missing data on key variables (e.g., age, sex, drug screen items), data capture glitches, duplicate entries and cases with positive reporting of using a fake drug (*Xenorap*). Given the number of respondents and the extensive number of questions, it is not surprising that non-core items included in the present analyses generated missing responses. Complete-case analyses were used given limited gain