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Energy-drink consumption and its relationship with substance use and sensation seeking among 10th grade students in Istanbul

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ABSTRACT

Aim of this study was to determine the prevalence and correlates of energy-drink (ED) consumption among 10th grade students in Istanbul/Turkey. Cross-sectional online self-report survey conducted in 45 schools from the 15 districts in Istanbul. The questionnaire included sections about demographic data, self-destructive behavior and use of substances including tobacco, alcohol and drugs. Also Psychological Screening Test for Adolescents (PSTA) was used. The analyses were conducted based on the 4957 subjects. Rate of those reported a ED consumption once within last year was 62.0% (n = 3072), whereas rate of those reported ED consumption at least once in a month was 31.1%. There were consistent, statistically significant associations between genders, lifetime substance use (tobacco, alcohol and drug use), measures of sensation seeking, psychological problems (depression, anxiety, anger, impulsivity) and self-destructive behavior (self-harming behavior and suicidal thoughts) with ED consumption. In logistic regression models male gender, sensation seeking, life-time tobacco, alcohol and drug use predicted all frequencies of ED consumption. In addition to these predictors, anger and self-harming behavior also predicted ED consumption at least once in a month. There were no interactions between the associations of lifetime tobacco, alcohol and drug use with ED consumption. The findings suggest that the ED consumption of male students is related with three clusters of substances (tobacco, alcohol and drug) through sensation seeking and these relationships do not interact with each other.

1. Introduction

Energy drinks (EDs) are beverages designed to increase energy through the combination of typically high levels of caffeine and other ingredients such as taurine and B vitamins (Heckman et al., 2010). The primary consumers of EDs are teenagers and young adults, and in particular, young adult males (Berger et al., 2011, 2013). Marketing strategies for EDs include statements that these products may boost energy, concentration, and athletic performance (Rath, 2012), which all may attract the attention of adolescents and young adults. These marketed effects of EDs are theoretically attributed to the high caffeine content, which can range anywhere from 50 to 505 mg per can or bottle (Reissig et al., 2009). Recent investigations have highlighted potential concerns about ED consumption by children, adolescents, and young adults (Seifert et al., 2011; Gunja and Brown, 2012), especially vulnerable subgroups among these populations (Seifert et al., 2011). Although EDs have been found to improve attention and/or reaction times and indices of alertness in some studies, they have stimulating properties that can boost heart rate and blood pressure, dehydrate the body, may aggravate the effects of other stimulants, and prevent sleep, particularly in adolescents and young adults (Attila and Cakir, 2011).

The absence of regulatory oversight in many countries has resulted in aggressive marketing of EDs over the world, targeted primarily toward adolescents and young adults (Attila and Cakir, 2011). Consistent with this, previous studies found high past-month prevalence of ED use among college students, with estimates ranging from 39% to 57% (Malinauskas et al., 2007; Oteri et al., 2007; Miller, 2008a,b). Results from studies conducted among high school students are similar. A survey study conducted in Ontario Canada in 2011 among 4342 students in grades 7 through 12 showed that 49.6% of adolescents had consumed EDs

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in the previous year and 19.1% had consumed ED in the previous week (Hamilton et al., 2013). In a cross-sectional survey conducted in 2012 among students in grades 7, 9, 10 and 12 attending public schools in Atlantic Canada, nearly two-thirds (62%) reported consuming ED at least once in the previous year, while about 20% reporting use once or more per month (Azagba et al., 2014). Data obtained from the recent study conducted among 815 American students aged 12–17 showed that approximately 8.5% of youth consumed EDs weekly (Kumar et al., 2014). Finally, in a recent cross-sectional survey study conducted in America with a nationally representative samples of 8th-, 10th-, and 12th-grade students in 2010–2011 approximately 30% of students reported consuming EDs or shots (Terry-McElrath et al., 2014).

Previous studies point out that a significant number of college students in North America and elsewhere consume EDs, and that consumption is typically higher in young males, those involved in substance use, prescription drug use and violent conduct (Oteri et al., 2007; Miller, 2008a,b; Arria et al., 2010; Velazquez et al., 2012; Hoyte et al., 2013). International studies have indicated that mixing ED with alcohol is fairly frequent among young people, with rates ranging from 40.0% to 87.6% among those who consume EDs regularly (Berger et al., 2013; Attila and Cakir, 2011; Malinauskas et al., 2007; Oteri et al., 2007; Ballistreri and Corradi-Webster, 2008). The consumption of alcohol mixed with EDs also increase the risk of marijuana, cocaine, and ecstasy use among young adults (Snipes and Benotsch, 2013) and is associated with higher odds of smoking susceptibility among adolescents (Azagba and Sharaf, 2014).

Research evidence suggests a link between high caffeine consumption and other drug problems. Heavy caffeine use, caffeine toxicity, and caffeine dependence have been shown to significantly increase the odds of developing a substance use disorder, including abuse or dependence on cannabis, cocaine, or alcohol (Kendler et al., 2006). It has been reported that a common genetic factor is associated with caffeine, nicotine, and alcohol abuse (Swan et al., 1996, 1997; Hettema et al., 1999; Kendler et al., 2007). Consistent with this, previous studies suggested that dependence on caffeine, nicotine and alcohol were governed by the same factors (Kozlowski et al., 1993; Strain et al., 1994).

ED users have higher risk-taking tendencies and substance involvement than non-users (Oteri et al., 2007; Miller, 2008a,b; Arria et al., 2010; O'Brien et al., 2008). Self-reported tobacco smoking, alcohol-related problems, marijuana and illicit prescription drug use were also positively associated with frequency of ED consumption among college students (Miller, 2008a,b). A cross-sectional study that was conducted among university students in Ankara Turkey found that frequency of ED consumption was higher in students ever smoked cigarettes and drank alcoholic beverages (Attila and Cakir, 2011). A study conducted in a large public university suggested that compared to ED non-users, ED users had heavier alcohol consumption patterns, were more likely to have used other drugs, and has a unique relationship with nonmedical use of prescription stimulants and analgesics (Arria et al., 2010). Weekly or daily ED consumption was strongly associated with alcohol dependence (Arria et al., 2011). Consistent with these findings gained from university populations, recent survey studies conducted among high school students in Canada (Hamilton et al., 2013; Azagba et al., 2014) and America (Terry-McElrath et al., 2014) suggested a strong association between ED consumption and substance use. Several studies also suggest that caffeine (Collins et al., 1997; Pallanti et al., 2006) and caffeine containing EDs (Reissig et al., 2009; Arria et al., 2008) may serve as a gateway to other forms of drug dependence. One study of university students found that ED consumption significantly predicted subsequent nonmedical prescription stimulant use (Arria et al., 2008).

A cross-sectional study conducted among Turkish university students found that many students who had "ever" tried an ED did so the first time because they wondered about its' taste (Attila and Cakir, 2011). ED users tend to have greater involvement in alcohol and other drug use and higher levels of sensation-seeking, relative to non-users of EDs (Arria et al., 2010). Zuckerman (1979) defined sensation seeking as a biosocial personality trait characterized by "the need for varied, novel, and complex sensations and experiences, and the willingness to take physical and social risks for the sake of such experiences". Sensation-seeking has been linked to binge drinking (Carlson et al., 2010), alcohol-related injury (Mundt et al., 2009), and alcohol-impaired driving (Zakletskaia et al., 2009). Sensation seeking may lead an individual to both heavier ED use and heavier alcohol use (Verster et al., 2012). Thus, it is possible that the observed associations between consuming ED and substance use could be explained by the fact that these two behaviors share common risk factor such as sensation seeking. Sensation-seeking has long been recognized as an important risk factor for substance use problems in adolescents (Tarter et al., 1999). Consistent with these survey studies conducted in North America suggested that ED consumption was highly associated with sensation-seeking (Hamilton et al., 2013; Azagba et al., 2014; Terry-McElrath et al., 2014) and that adolescent groups with high sensation-seeking may be particularly likely to consume ED and to be substance users (Terry-McElrath et al., 2014). All of these studies that were conducted in North America did not controlled psychological symptoms and self-destructive behaviors on relationship between the consumption of ED and substance use among high school students.

This study aimed to: (1) describe the prevalence of ED consumption among 10th grade students in Istanbul/Turkey; (2) compare users and non-users of EDs with respect to gender, sensation seeking, and substance-use characteristics, while controlling the effect of psychological factors; and, (3) examine the interaction between the effects of three clusters of substances on ED consumption. We hypothesize that ED use will be related to an increased risk for lifetime use of other substances through sensation seeking.

2. Methods

2.1. Settings and sample

Multi-stage sampling was performed to select subjects. Multi-stage sample initially stratified according to the Istanbul's 15 districts. Tenth-grade students in different geographical areas and different schools were enrolled into the study. The primary sampling units were schools, selected with a probability proportional to student enrollment numbers (45 schools from the 15 districts). Next, one or two classes within each participating school were selected systematically with equal probability sampling. All students in selected classes were included into the study sample. Determination of the sample (Evren et al., 2014a,b) and the socio-demographic characteristics of the cohort were mentioned in more detailed elsewhere (Evren et al., 2014b).

Five thousand three hundred eighty three students participated in the study and entered to the system from the Internet and filled the questionnaire. Although none of the students refused to participate in the study, 410 students were excluded because they left some parts of the scales unfilled, 16 students were excluded because of the trap question. Thus, a representative sample of 4957 students participated in the study. When we compared the students excluded from the study and included in the study, mean of age (16.69 ± 6.44, 15.56 ± 2.74, respectively, $t = 3.57$, $p < 0.001$) and male ratio (62.8% and 52.7%, respectively, $\chi^2 = 16.11$, d.f. = 1, $p < 0.001$) were higher in the excluded group.