

SA1-274. Energy Drinks on College Campuses: Motivations, Risky Behaviors, and Health Concerns

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Objectives:

1. Describe demographics of energy drink consumption in college students.
2. Discuss motivations for energy drink consumption.
3. Identify health concerns associated with energy drinks.
4. Describe the relationship between energy drink consumption and risk-taking behaviors.

Beverage vs. Dietary Supplement Regulation: FDA regulates dietary supplements under a different set of regulations than those covering "conventional" foods and drug products. Under the Dietary Supplement Health and Education Act of 1994 (DSHEA):

- The **manufacturer** of a dietary supplement or dietary ingredient is responsible for ensuring that the product is safe before it is marketed.
- FDA is responsible for taking action against any unsafe dietary supplement product **after** it reaches the market.
- In addition, the manufacturer, packer, or distributor whose name appears on the label of a dietary supplement marketed in the United States is **required to submit to FDA all serious adverse event reports** associated with use of the dietary supplement in the United States.
- FDA's responsibilities include product information, such as labeling, claims, package inserts, and accompanying literature. The **Federal Trade Commission (FTC)** regulates dietary supplement advertising.
- Dietary ingredients (the "active ingredients" in dietary supplements) **require no FDA preapproval** to be used in a dietary supplement, and the FDCA requires FDA to prove that a product is unsafe under the conditions of use suggested in the labeling in order to take the product off the market.

Marketing Strategies

ED companies strategically use clever slogans and icons in order to appeal to a large demographic, such as stressed out college students, young adults involved in the "party scene", exhausted working professionals, and people who enjoy extreme sports/adventure. This "lifestyle branding" capitalizes on students' anxieties, sleep problems, and social identities. Energy Drinks are consumed by 30 – 50% of young adults; the US is the largest market, and in the US adolescents & young adults are the largest consumers.

Caffeine Effects

Desirable effects at lower doses: 50-250mg, CNS stimulant, increased alertness, concentration, bronchial dilator

Mild Toxicity at higher doses: 250-600mg, restlessness, anxiety, insomnia, elevated heart rate, headache, tremors, GI distress

Toxicity at Very High Doses: > 900 mg, Tachycardia and arrhythmia; overt excitement, delirium and clonic seizures

FDA recommends that adolescents not exceed 100mg and 2.5 mg/kg a day

Pharmacokinetics

- Readily absorbed through intestines in ~30 minutes. Half-life varies according to individual: Average adult – 3-5 hrs; Oral Contraceptive Users / Pregnant Women – 7-8 hrs; smoker – 2-3 hrs
- Distributes into all body compartments; passes easily into brain, breast milk and crosses placenta
- Metabolized in the liver; >95% excreted in the urine

Energy Drink Types

- **Energy Drinks** 8- 24oz cans; Ex: Monster, RedBull, Rockstar, AMP, Full Throttle. Come in sugar-free, low-carb, and fully sugared varieties (Hype energy 67 sugar grams). Usually "fruit" flavored.
- **Energy Shots** 2 oz minibottles; Ex: 5 hour energy, iShot Skinny Energy, 357 Super Magnum. Low cal, fruit flavored super concentrated caffeine.
- **Alcoholic Energy Drinks:** 6 – 24 oz cans. Ex: Four Loko, CORE, TILT, MAX, Mate Vesa. **Most are no longer legally sold in the US** after a series of adverse events.
- **Sports enhancers:** Ex: Clif Turbo Shot Energy Gel, Ripped Freak Powder, Muscle Tech NeuroCore
- **Other:** Energy Gums (50 mg / stick) like X8 energy Gum, Energy Powder Mix (G Fuel 150 mg/serving)

Study 1: Survey Findings from Energy Drinks on College Campuses Survey (Kelly & Prichard original data)

- Online survey of sleep, health behaviors, risk taking. N=167
- Students who use energy drinks more than a few times a month were more likely to engage in risky behaviors including not wearing a seatbelt, driving after drinking alcohol, getting into a fist fight, and were more likely to agree with statements like “I like taking chances”.
- Students who used energy drinks more frequently were more likely to use alcohol, marijuana, nicotine, and prescription drugs illicitly, drink to the point of blackout, and do things they regret while drinking.
- Students who mixed alcohol with energy drinks said they did so for the taste, to help them stay awake, and to enhance the feelings of intoxication.
- Regular energy drink users were more likely to have poor sleep including sleep onset insomnia, later bedtimes, and stay awake all night long.
- Students with psychiatric diagnoses including panic disorder, anorexia, ADHD, insomnia, depression, and anxiety disorder were significantly more likely than those without diagnoses to use energy drinks.

Health Concerns associated with preexisting conditions:

High levels of caffeine are particularly dangerous for those with: Cardiac conditions including channelopathies, arrhythmias, hypertension, and cardiac effects related to electrolyte imbalance (e.g. eating disorders); Diabetes: Sugar and caffeine work synergistically to increase postprandial hyperglycemia; Sleep disorders; disruption of slow wave sleep, sleep onset insomnia, increased nocturnal awakening and insomnia; Anxiety: side effects mimic biomarkers for anxiety including increased blood pressure, heart rate, racing thoughts, jitters. Possible ‘gateway’ drug, especially with early exposure to energy drinks;.

Health Concerns from added ingredients- Drug Interactions (see Seifert et al., 2011)

- 5-Hydroxy tryptophan: should not be combined with monoamine oxidase inhibitors
- Vinpocetine Increases the risk for excessive bleeding and should not be combined with aspirin, clopidogrel, warfarin, pentoxifylline, vitamin E, garlic, and ginkgo
- Yohimbine affects cardiac function and should not be combined with tricyclic antidepressants, bupropion, phenothiazines, clonidine, stimulants, decongestants, or other blood pressure-lowering medications
- Ginseng prolongs bleeding time and should not be combined with warfarin; interacts with phenelzine sulfate in patients being treated for mania; may interfere with estrogens or corticosteroids; may impede digoxin metabolism; reduces blood glucose levels

Health Concerns from mixing energy drinks with alcohol (see O’Brien 2008, Velazquez 2011, Marcziński 2011)

- Reduces awareness of the cognitive/behavioral effects of alcohol
- Event level analysis showed energy drink / alcohol users were more likely to drive home drunk and underestimate their BAC

Study 2: Energy Drink and Risk Taking Laboratory Experiment (Kelly & Prichard original data)

- Placebo-controlled, double blind experimental study. Investigated risk taking through two online measures in college students immediately after taking a 5hr energy drink.
- Overall, Participants performed no differently after drinking 5hr energy than after a placebo (Balloon test: $t=-0.207$, $p<0.838$; Iowa Gambling Tasking: $t=0.00$, $P=1.000$). However, women showed more risk-taking (performed worse) after taking the drug, whereas male performance was enhanced ($t=2.433$, $p<0.05$).

Caffeine content for common coffees, teas, soft drinks, energy drinks, and OTC pills

Coffees	Serving Size	Caffeine (mg)
Starbucks Coffee	venti, 20 fl. oz.	415
Maxwell House Ground Coffee	2 Tbs., makes 12 fl. oz.	100-160
Starbucks Espresso	doppio, 2 fl. oz.	150
McDonald's Coffee	large, 16 fl. oz.	133
Maxwell House International Café, all flavors	2½ Tbs., makes 12-16 fl. oz.	40-130
Teas		
Black tea, brewed for 3 minutes	8 fl. oz.	30-80
Green tea, brewed for 3 minutes	8 fl. oz.	35-60
Lipton 100% Natural Lemon Iced Tea, bottle	20 fl. oz.	35
Arizona Iced Tea, black, all varieties	16 fl. oz.	30
Lipton Decaffeinated Tea—black or green, brewed	8 fl. oz.	5
FDA official limit for cola beverages	12 oz.	71 (200 parts per million)
Pepsi MAX	12 oz.	69
Mountain Dew, regular or diet	12 oz.	54 (20 oz. = 90)
Diet Coke	12 oz.	47 (20 oz. = 78)
Dr Pepper or Sunkist, regular or diet	12 oz.	41 (20 oz. = 68)
Coca-Cola, Coke Zero, or Diet Pepsi	12 oz.	35 (20 oz. = 58)
Barq's Root Beer, regular	12 oz.	23 (20 oz. = 38)
7-Up, Fanta, Fresca, ginger ale, or Sprite, most root bears	12 oz.	0
Energy Drinks & Shots		
5-hour Energy	1.9 fl. oz.	208
Full Throttle	16 fl. oz.	200
Monster Energy	16 fl. oz.	160
Rockstar	16 fl. oz.	160
AMP Energy Boost Original	16 fl. oz.	142
Red Bull	8.4 fl. oz.	80
V8 V-Fusion+Energy	8 fl. oz.	80
Ocean Spray Cran-Energy	20 fl. oz.	55
Glacéau Vitaminwater Energy	20 fl. oz.	50
Starbucks Refreshers	12 fl. oz.	50
Caffeinated Snack Foods		
Crackheads Espresso Bean Candies, hyper	1 box, 40g	600
Crackheads Espresso Bean Candies, regular	1 package, 28 pieces	200
Wired Waffles	1 waffle	200
Perky Jerky	1 package, 1 oz.	150
Arma Potato Chips	1 package, 2 oz.	70
Cracker Jack'D	1 package, 2 oz.	70
MiO Energy, all flavors	1 squirt, ½ tsp.	60
Crystal Light Energy	½ packet	60
Jelly Belly Extreme Sport Beans	1 package, 1 oz.	50
Jolt Gum	1 piece	45
Alert Gum	1 piece	40
Blue Diamond Almonds, Roasted Coffee Flavored	1 oz.	25
Over-The-Counter Pills		
Zantrex-3 weight-loss supplement	2 capsules	300
NoDoz or Vivarin	1 caplet	200
Excedrin Migraine	2 tablets	130
Midol Complete	2 caplets	120
Bayer Back & Body	2 caplets	65
Anacin	2 tablets	64

Recommended reading.

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FDA 101: Dietary supplements. <http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm050803.htm>

FDA Adverse Effects from Energy Drinks:

<http://www.fda.gov/downloads/AboutFDA/CentersOffices/OfficeofFoods/CFSAN/CFSANFOIAElectronicReadingRoom/UCM328270.pdf>

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Velazquez, C., Poulos, N., Latimer, L., & Pasch, K. (2011). Associations between energy drink consumption and alcohol use behaviors among college students. *Drug and Alcohol Dependence*, doi:10.1016/j.drugalcdep.2011.11.006