Energy Drinks Mixed with Alcohol: What are the Risks?

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The Use and Biology of Energy Drinks:
Current Knowledge and Critical Gaps
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IMPORTED
Jägermeister
ROCKSTAR
ENERGY DRINK


Jägermeister
MONSTER
ENERGY


Red


2013
CINCINNATI
DJ BATTLE
TORO
DRINK
SPECIALS
All Drinks Featuring:
RED BULL Energy Drink
RED BULL Sugarfree
RED BULL Red Edition
RED BULL Silver Edition
RED BULL Blue Edition
RED BULL & GREY GOOSE VODKA | $5
RED BULL & GREY GOOSE CHERRY NOIR VODKA | $5
RED BULL & BACARDI BOMBS | $3
featuring any Bacardi flavored rum
RED COSMO | $5
Red Bull Red Edition, Grey Goose Vodka,
Triple Sec, Lime Juice, Lime Wedge
MOSCOW BULL | $5
Red Bull Silver Edition, Grey Goose Vodka,
Ginger Beer, Simple Syrup, Lime Wedge
RED BULL BLUE COCONUT | $5
Red Bull Blue Edition,
Bacardi Rock Coconut Rum,
Blue Curacao,
Orange Slice
FLYBOY
PRO SOUND

History: Alcohol mixed with Energy Drinks (AmED)

Four Loko:
1. Alcohol
2. Caffeine
3. Taurine
4. Guarana

November, 2010 –

FDA Warning Letters issued to makers of premixed caffeinated alcoholic beverages - AmED *beverages present a public health concern*

- Premixed versions of AmED are no longer available

Emergency department visits in U.S. involving energy drinks has increased 10-fold in only 5 years; subset of these visits involved AmED (SAMHSA, 2013)

Safety concerns associated with AmED beverages

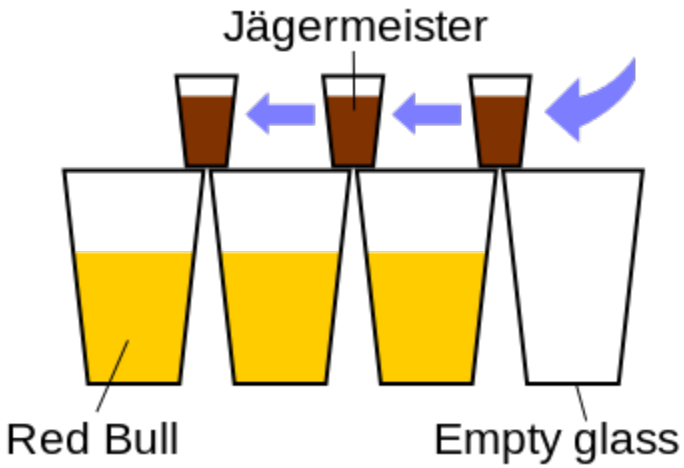
- Binge drinking (i.e., drinking to intoxication); higher BACs
- Intention to drive while impaired
- Riding with an intoxicated driver
- Being physically hurt or injured
- Needing medical treatment after drinking
- Risky sexual behavior
- Risk of alcohol dependence

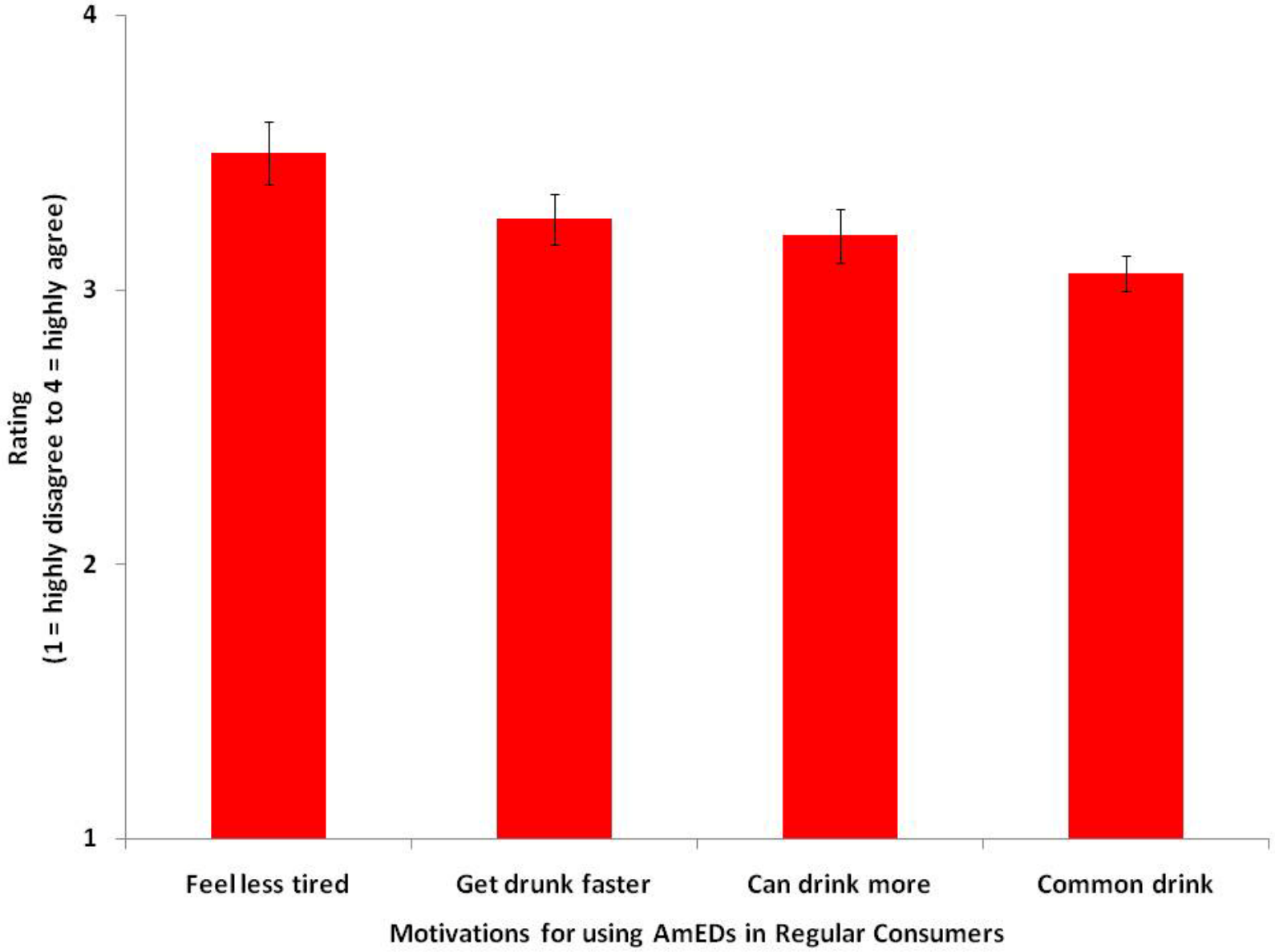
(Arria et al., 2010, 2011; Berger et al., 2011, 2013; Brache & Stockwell, 2011; Cheng et al., 2012; Mallett et al., in press; Miller, 2012; O'Brien et al., 2008; Peacock et al., 2012; Price et al., 2010; Thombs et al., 2010; Velazquez et al., 2012).

Why is AmED different than alcohol alone?

AmED beverages are associated with greater risks associated with alcohol consumption. Why?

A) Consumers of AmED may differ in trait impulsivity or risk-taking propensity (Verster et al., 2012)





Marczinski (2011). Alcohol mixed with energy drinks: Consumption patterns and motivations for use in U.S. college students. *International Journal of Environmental Research and Public Health, 8*, 3232-3245.

Why is AmED different than alcohol alone?

(B) Energy drinks/caffeine – **pharmacological** alteration in subjective state of the alcohol consumer which increases the risks of drinking (Ferreira et al., 2006; Marczinski & Fillmore, 2006)

1) Decreased perceived intoxication

2) Enhanced stimulation/reduced fatigue

3) Enhanced motivation to drink more alcohol

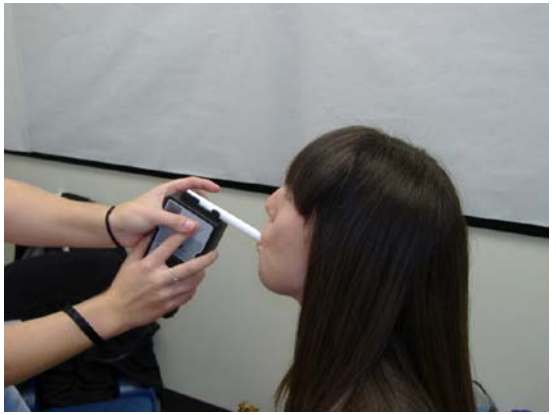
Sedation is an internal cue to stop drinking and a stimulant mixed with alcohol would alter that cue (Marczinski, Fillmore et al., 2011, 2012).

General Methods

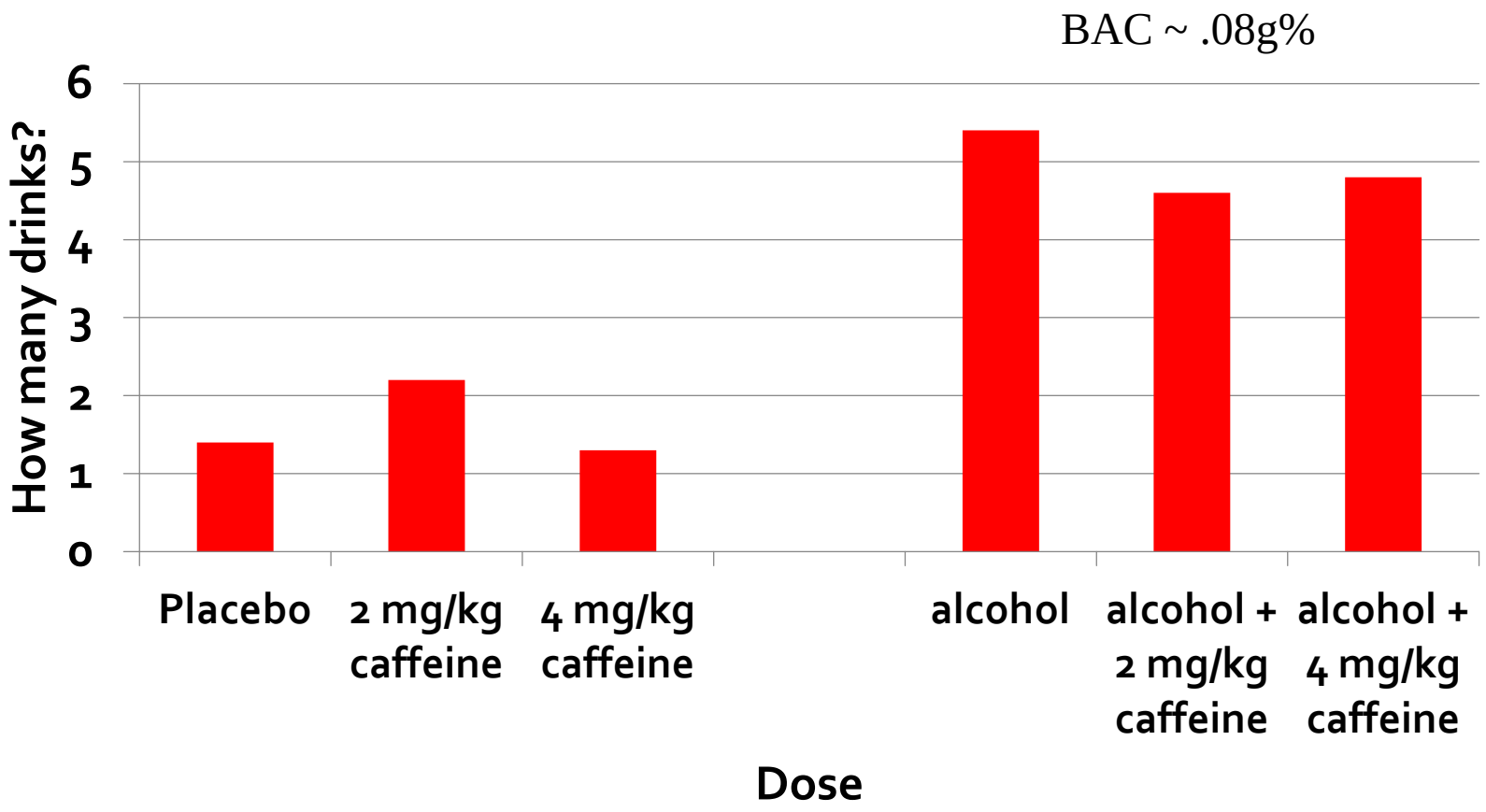
- Subjects (equal gender) attend one or more sessions where they receive alcohol, energy drink, AmED or a placebo beverage.
- Alcohol doses (~2 to ~4 shots vodka) peak BACs of .04 g% to .08 g%
- Red Bull used as energy drink
- 2:1 energy drink: vodka for AmED
- Squirt as placebo beverage
- Double-blind dose administration
- Drink consumed within 10 min.

General Methods

- Objective measures:
  - BAC
  - Neurocognitive measures – reaction time, impulse control, information processing speed
- Subjective measures:
  - Perceived intoxication
  - Stimulation/sedation
  - Willingness to drive

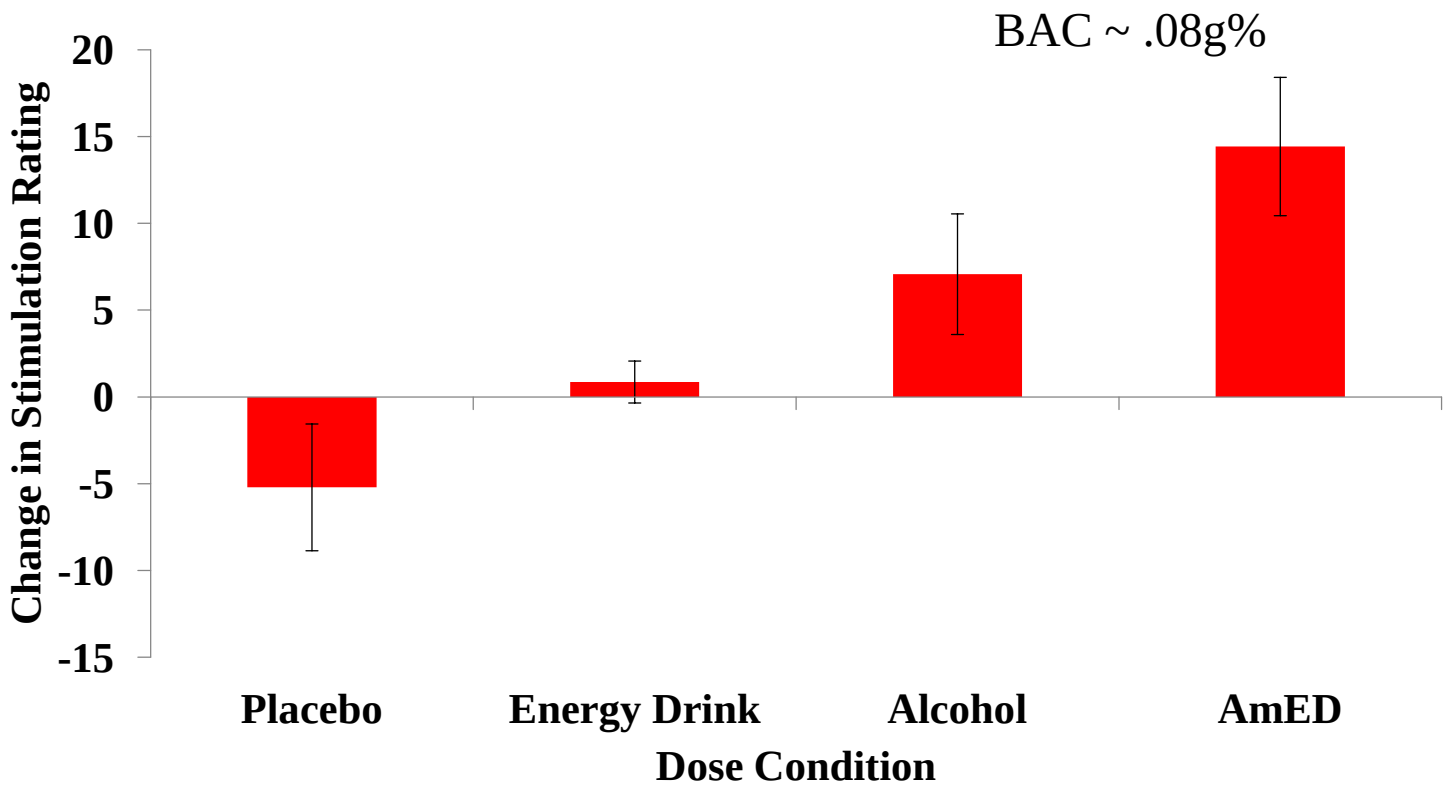


1) Decreased perceived intoxication for AmED v. alcohol alone



Marczinski & Fillmore (2006). Clubgoers and their trendy cocktails: Implications of mixing caffeine into alcohol on information processing and subjective reports of intoxication. *Experimental and Clinical Psychopharmacology, 14*, 450-458.

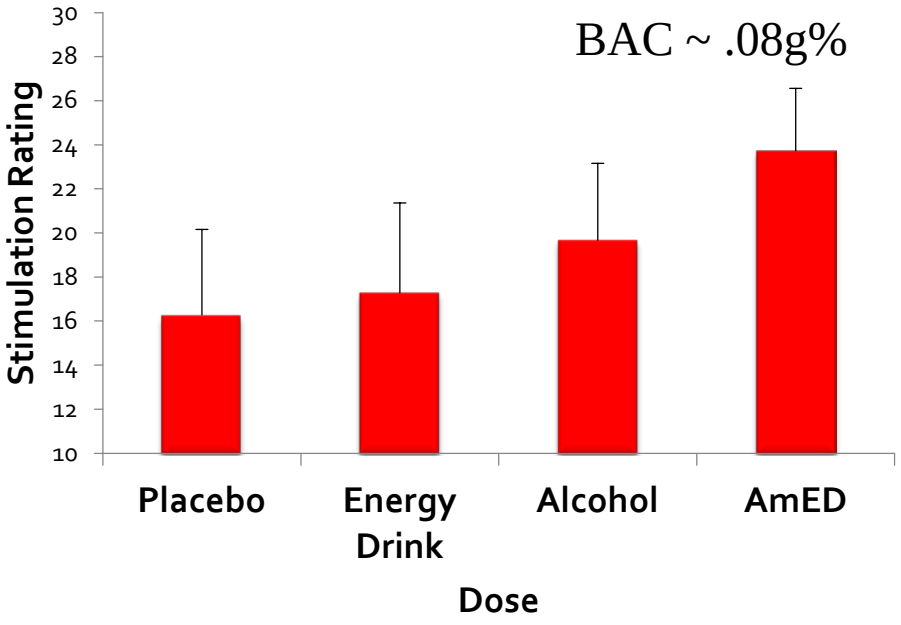
2) Enhanced feelings of stimulation for AmED v. alcohol alone

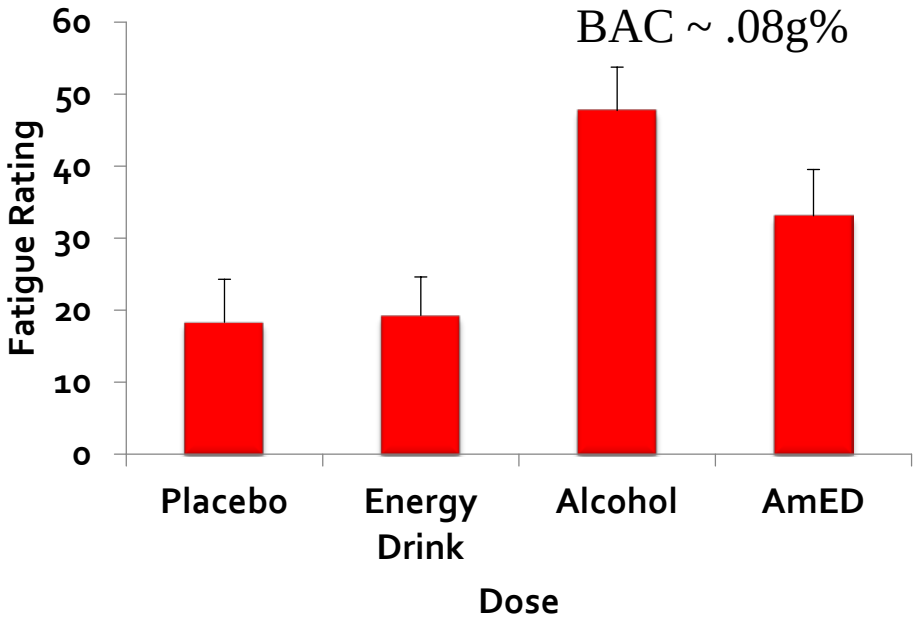


Marczinski, Fillmore et al. (2011). Effects of energy drinks mixed with alcohol on behavioral control: Risks for college students consuming trendy cocktails. *Alcoholism: Clinical and Experimental Research*, *35*, 1282-1292.

- *Also see Peacock et al. (2013) in ACER.*

Enhanced stimulation/decreased fatigue for AmED v. alcohol





Marczinski, Fillmore et al. (2012). Effects of energy drinks mixed with alcohol on information processing, motor coordination and subjective reports of intoxication. *Experimental and Clinical Psychopharmacology, 20*, 129-138.

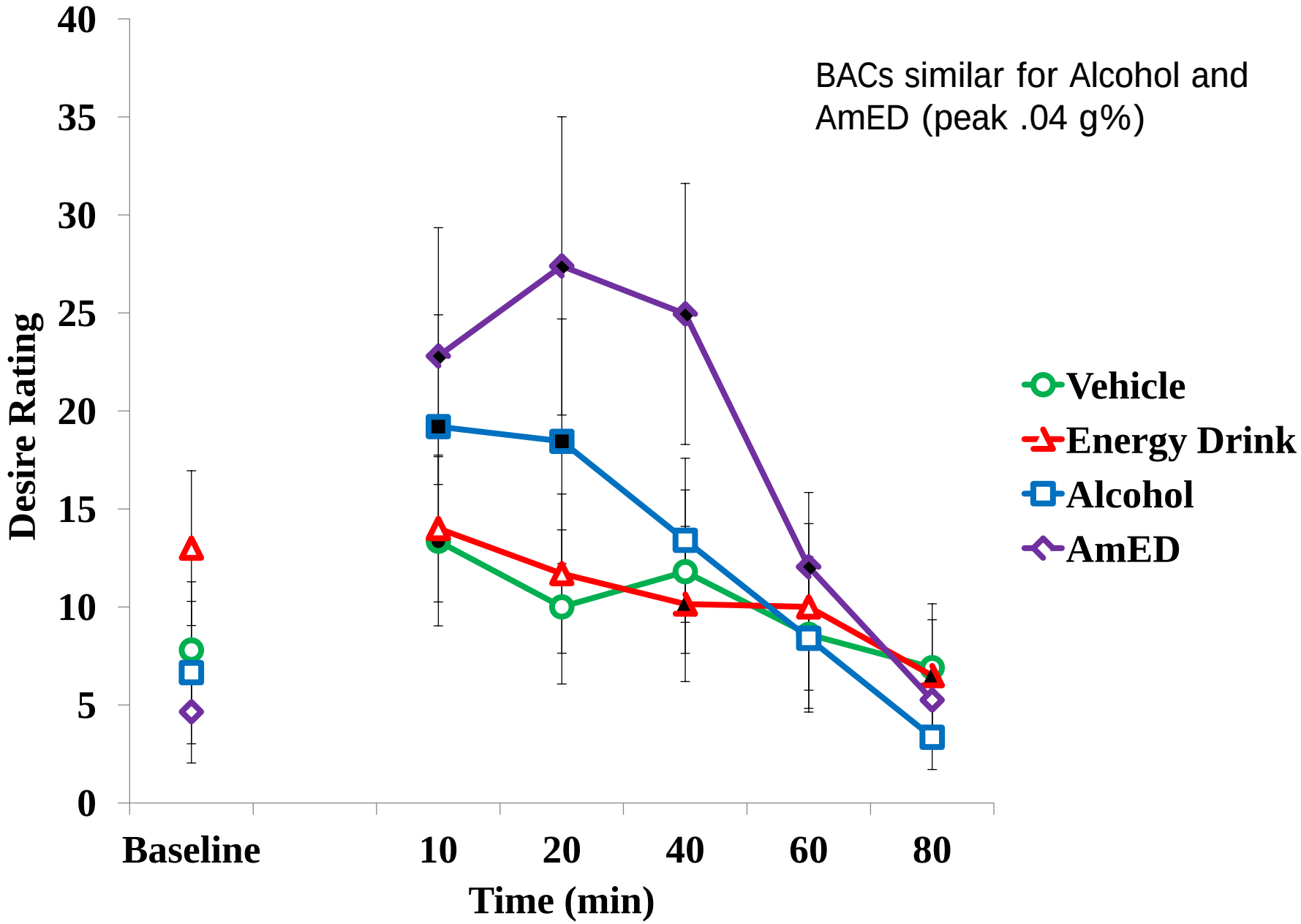
Disconnect between subjective state and actual impairment

- AmED (v. alcohol)
  - Decreased perceived intoxication
  - Decreased fatigue
  - Enhanced stimulation

- Actual behavioral impairment (impulse control, information processing speed) similar for AmED and alcohol
- BAC is not altered by energy drink mixer

3) Increased motivation to drink for AmED v. alcohol alone

- Priming: a small dose of alcohol increases the desire to drink
- Caffeine has been shown to promote alcohol consumption in laboratory animals (Dietze & Kulkosky, 1991; Kunin et al., 2000).



Marczinski, Fillmore et al. (2013). Mixing an energy drink with an alcoholic beverage increases motivation for more alcohol in college students. *Alcoholism: Clinical and Experimental Research, 37,* 276-283.

Implications of Results

Energy drinks – alter subjective state of the alcohol consumer which increases the risks of drinking

1) Decreased perceived intoxication

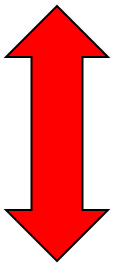
2) Enhanced stimulation/reduced fatigue

3) Enhanced motivation to drink more alcohol

Both immediate and long-term risks to the drinker.

Alcohol mixed with Energy Drinks

Behavioral Impairment

???  Disconnect

Subjective Impairment

May account for increased drinking, increased impaired driving, and alcohol dependence risk in AmED users

Possible mechanism

- Alcohol increases extracellular adenosine which regulates sedative effects of alcohol (Nam et al., 2013)
- CNS interaction between alcohol and the adenosine system upon which caffeine acts (Arolfo et al., 2004; Butler & Prendergast, 2012; Sharma et al., 2010)
- Translational research may better elucidate possible underlying mechanisms explaining why AmEDs may lead to increased drinking.

Ferreira et al. (in press). Expression of behavioral sensitization to ethanol is increased by energy drink administration. *Pharmacology, Biochemistry and Behavior.*

Hilbert et al. (2013). Conditioned reinforcement and locomotor activating effects of caffeine and ethanol combinations in mice. *Pharmacology, Biochemistry and Behavior.*

Unknown: AmED trend due to stimulant substitution?

Smoking now not permitted in most bars.
Energy drinks instead of nicotine?

Acknowledgements

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