A Dissertation
entitled
Energy Drink Expectancies Among College Students

by
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Submitted to the Graduate Faculty as partial fulfillment of the requirements for the
Doctor of Philosophy Degree in Health Education

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Introduction: Energy drinks are part of a growing industry that targets the college population, among others, with aggressive marketing tactics, by promoting greater focus and more energy with their product consumption (Heckman, Sherry, & Gonzalez de Mejia, 2010; Spierer, Blanding, & Santella, 2014). Energy drinks are associated with a multitude of consequences, including emergency room visits and hospitalization (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013; SAMHSA, 2014). Additionally, they are linked with heavy drinking, poor academic outcomes, and drug use (Spieler et al., 2014; Pettit & DeBarr, 2011; Woolsey et al., 2014). The research on the consequences and behaviors associated with the mixing of alcohol and energy drinks and college students (AmEDs) is widespread; however, to date, a comprehensive literature review on the topic does not exist. Another gap in literature is the lack of information on the expectancies college students have regarding the consumption of energy drinks and how that impacts their use. Both of the aforementioned issues are the subject matter of this dissertation.

Purpose: This alternative dissertation includes two separate studies. The first study was a systematic literature review, which was completed with the purpose of summarizing and identifying the gaps in literature regarding energy drinks and their use with alcohol among college students. The second study was a result of the first, where there was an evident gap in the literature, as there were no data on the energy drink expectancies of college students. Therefore, the purpose of the second study was to explore the energy drink expectancies of college students.

Methods: (Study 1) The systematic literature review was completed using multiple academic search engines, including Academic Search Complete, ERIC, Medline, PsychInfo, PubMed, Web of Science, ProQuest, and Google Scholar databases. The article inclusion criteria were that the topical focus was on AmED consumption among United States undergraduate college students aged 18 to 25. (Study 2) An alcohol and drug use questionnaire that contained 74-items was used to assess energy drink expectancies of undergraduate college students (n=1,246), aged 18 to 25. The variance in past 30-day energy drink consumption accounted for by energy drink expectancies were determined by a multinomial logistic regression analysis. Further, to understand which expectancies predicted energy drink consumption, binary logistic regression analyses were conducted with each expectancy factor.

Results: (Study 1) Of the 164 articles found in the search process, 35 met the inclusion criteria for the systematic literature review. The level of scientific rigor varied, as neither the response rates nor validity measures were included in the majority of articles. In addition, convenience samples, self-reported data, and

single site samples were common. (Study 2) With regard to the cross-sectional study, the expectancy factors were found to account for 24.3% of the variance in past 30-day energy drink consumption. Further, four expectancy factors were found to be significantly related to energy drink consumption including Anxiety/Negative Physical Effects, Withdrawal, Energy Enhancement, and Social/Mood Enhancement.

Conclusions: Results from the literature indicate that more scientific rigor needs to be utilized with future research. Specifically, collecting and reporting response rates and validity measures, as well as using randomized and more heterogeneous samples. Further, it fueled the cross-sectional study as there was a gap in the literature regarding energy drink expectancies of college students. The Anxiety/Negative Physical Effects expectancy was found to be the strongest overall expectancy and negative expectancy, while Energy Enhancement was the strongest positive expectancy. Based on the results of this study, practitioners should educate college students highlighting the negative outcomes associated with energy drink consumption, while correcting the misperceptions concerning the positive expectancies consumers have in an effort to curb consumption.

This is dedicated to those who aren't believed in.

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List of Abbreviations

AmED.....	Alcohol mixed with Energy Drinks
BAC.....	Blood Alcohol Content
CAB.....	Caffeinated Alcohol Beverage
CEQ.....	Caffeine Expectancies Questionnaire
df.....	Degrees of Freedom
ED.....	Energy Drink
FDA.....	Food and Drug Administration
GPA.....	Grade Point Average
IRB.....	Internal Review Board
NA.....	Not Applicable
NCHA.....	National College Health Assessment
NIAAA.....	National Institute of Alcohol Abuse and Alcoholism
NIDA.....	National Institute of Drug Abuse
NIH.....	National Institutes of Health
NSF.....	National Science Foundation
SAMHSA.....	Substance Abuse and Mental Health Services Administration
SD.....	Standard Deviation
US.....	United States

List of Symbols

χ^2	Chi-square
R^2	Coefficient of determination
©.....	Copyright
=.....	Equals
>.....	Greater than
<.....	Less than
p	p-value
®.....	Registered Trademark
n	Sample Size

Chapter 1

Introduction

This chapter delineates the purpose of the study and provides an overview of the issues surrounding energy drink consumption among college students. It includes: Estimates of Energy Drink Use; the Economic, Social, and Health Impact of Energy Drink Use; Energy Drinks in Combination with Alcohol; Purpose of the Study; Definition of Terms; Research Questions and Hypotheses; and Delimitations and Limitations.

Energy Drink Use and Its Impact

Economic Impact of Energy Drink Use.

Since the introduction of energy drinks to the United States in 1997, there has been tremendous economic growth (Spierer et al., 2014). From 2008 to 2012, sales for energy drinks increased by almost two-thirds. Since then energy drinks have become a multi-billion-dollar industry, with estimated U.S. sales that are expected to reach \$32 billion by 2025 (PR Newswire, 2017). In addition, it is estimated that the worldwide sales of energy drinks, \$39 billion in 2013, will reach \$61 billion by 2021 (Research and Markets, 2015).

The energy drink market is dominated by Red Bull® and Monster® at 43% and 39% of the market, respectively. Rockstar® holds less of the market with 10%, where Nos®, and Amp® hold even less at about 3% a piece. Monster®'s share of the market is expected to increase after its distribution partnership with Coca-Cola® (Mitchell, 2015). Due to this partnership and increased distribution across North American and international markets by Coca-Cola®, Forbes and Bloomberg project that Monster®'s

sales could increase approximately 50%, as a result of this merger (Lachapelle, 2014; Trefis Team, 2014).

Energy Drink Prevalence.

Reported rates of energy drink consumption among college students vary greatly from study to study. Researchers have reported weekly usage rates as low as 13% to as high as 59.1% of college students (Arria et al., 2011; Pettit & DeBarr, 2011; Poulos & Pasch, 2015; Velazquez et al., 2012). Additionally, 36.4% of college students indicated they consumed energy drinks within the past two-weeks (Marczinski, 2011). When examining energy drink use by athletes, it was discovered that around 80% of college students participating in sports used energy drinks to enhance their physical performance (Bulut et al., 2014). Furthermore, the typical energy drink user was described as being male, non-athlete, affiliated with Greek-life, and a current tobacco user (Gallucci, Martin, & Morgan, 2016). At the time of this study, no national data set exists to determine epidemiological trends regarding the consumption of energy drinks among college students.

Associated Behaviors with Energy Drinks.

Energy drink consumption can influence a college student's behavior and lifestyle. Energy drink use most notably has been associated with risky behaviors as well as unhealthy lifestyles. For example, dietary behaviors are correlated with energy drink use, where the consumption of energy drinks is linked with unhealthy weight loss and disordered eating. In addition, various body image variables that include difficulty to handle personal appearance, trying to lose weight, exercising to lose weight, consuming

diet pills to lose weight, and vomiting or taking laxatives to lose weight are all associated with energy drink consumption (Jeffers, Vatalaro Hill, & Benotsch, 2014).

Energy drink consumption has also been associated with deleterious academic outcomes. Indeed, Pettit & DeBarr (2011) report that as the energy drink use increased, academic performance decreased. The researchers speculated the poor academic outcomes may be due to the sleep deprivation associated with consuming energy drinks when *cramming* for exams or to meet other academic deadlines. They also discovered that students who consumed energy drinks, were more likely report higher perceived levels of stress (Pettit & DeBarr, 2011). Ianni and Lafreniere (2014) reported a significant positive correlation between grade orientation and the inability to stop consuming energy drinks. They further explain that this correlation could be due to individuals who have elevated academic goals, and are more motivated to find shortcuts to academic success than their peers who are less inclined to consume energy drinks. In addition, the same users may attribute their success to their consumption of energy drinks (Ianni & Lafreniere, 2014).

The abuse and misuse of prescription drugs, with or without a prescription, has been related to energy drink consumption. College students who consumed energy drinks were more likely to either misuse or abuse prescription drugs (Gallucci, Martin, & Ryan, 2015). Furthermore, Woolsey and colleagues (2014) found that the frequency of energy drink use was a significant predictor of illicit prescription drug use. In the same study, the researchers note all prescription drug users, legal or illicit, consumed energy drinks (Woolsey et al., 2014).

Spierer and colleagues (2014) reported associations between energy drink consumption and drinking alcohol heavily, drunk driving, and higher likelihood of riding with a drunk driver. In addition, high-frequency energy drink use was linked with drinking alcohol more often, heavier alcohol consumption, and a greater risk for alcohol related problems that included blacking out, hangovers, drinking to cope, enhancement motives for drinking, and meeting the criteria for alcohol dependence (Arria et al., 2011; Skewes, DeCou, & Gonzalez, 2013).

Energy Drink Use in Combination with Alcohol.

Combining alcohol with energy drinks (AmED) is a popular trend among college students. Marczinski (2011) reported that 44% of their sample, and 78% of alcohol users, had tried or were regular consumers of AmEDs. Furthermore, those who consumed AmEDs had specific motives for their behavior that included feeling less tired while drinking, getting drunk faster, and being able to drink more (Marczinski, 2011). Additionally, Droste et al. (2014) reported hedonistic, or pleasure seeking, motives predicted AmED use. AmED consumption has also been associated with sexual victimization among males and females, higher sexual consequences, higher levels of aggression and experiences of aggression, higher rates of injury, and higher risk for alcohol dependence (Droste et al., 2014; Marzell et al., 2014; Miller et al., 2016; Snipes et al., 2014).

Health Impact of Energy Drink Use.

The increased consumption of energy drinks has resulted in deleterious health consequences for some individuals. Between 2007 and 2011, emergency department visits doubled from about 10,000 to about 20,000 visits that were related to energy

drinks. Of the 20,000 emergency department visits in 2011, about 14,000 were due to adverse reactions and about 6,000 were due to misuse or abuse (SAMHSA, 2013). Furthermore, of the 20,000 emergency department visits in 2011, one in 10 resulted in hospitalization, which included energy drinks by themselves and in combination with alcohol. The adverse effects included fast paced or irregular heartbeat, high blood pressure and blood sugar, insomnia, headache, nervousness, and seizures (SAMHSA, 2013; SAMHSA, 2014).

Purpose of the Study

Article 1. The purpose of this study is to assess the research conducted on college students and alcohol mixed with energy drinks (AmED). The topical areas for this literature review include but are not limited to: AmED prevalence rates, associations between AmED consumption and health, associations between AmED consumption and academics. Additionally, the level of scientific rigor, including methods, validity, and reliability, are critiqued. The goal of this study is to identify the gaps in literature concerning college students and energy drinks.

Article 2. The purpose of this study is to examine the energy drink expectancies among college students. More specifically, the association between energy drink expectancies and alcohol consumption, other drug use, academic issues, and health outcomes will all be explored. Knowing the expectancies college students have for consuming energy drinks can inform health educators and campus officials when designing interventions to reduce energy drink consumption or AmED. Therefore, this research is important in order to help reduce the number of emergency room visits,

improve overall wellness, and to identify prevention strategies to reduce high-risk energy drink consumption.

Definitions

- AmED: Alcohol mixed with an Energy Drink (e.g., Red Bull and Vodka) (Marczinski, 2011).
- Drink (Alcoholic): An alcoholic drink is defined as being 12-ounces of beer (5% alcohol content), 8-ounces of malt liquor (7% alcohol content), 5-ounces of wine (12% alcohol content), or 1.5-ounces, or a shot, of 80-proof (40% alcohol content) distilled spirits or liquor (National Institute of Alcohol Abuse and Alcoholism [NIAAA], n.d.).
- Energy Drink: Caffeinated beverage, which is typically carbonated and may contain herbal supplements and amino acids. These beverages are marketed to stimulate the body mentally and physically. Examples include products such as Red Bull, Monster, Rock Star, Amp, 5-hr Energy, etc. This does not include beverages such as coffee, tea, or soda pop (Energy Drink, 2016). Caffeine amount is not standardized and ranges from 70 to 90 mg of caffeine per 8 ounces.
- Expectancy: Refer to an individual's beliefs about the expected outcome of performing a certain behavior, and the positive or negative values they place on the outcome. These are learned through experience, observation, or suggestion (Huntley & Juliano, 2012).
- Heavy Drinking: For men, consuming 15 or more drinks per week; for women, consuming 8 or more drinks per week (CDC, 2016).

- **High-risk Drinking:** A pattern of drinking that brings a person's blood alcohol concentration (BAC) to 0.08 g/dL or higher: This typically occurs when men consume 5 or more drinks, and when women consume 4 or more drinks, in about 2 hours (NIAAA, n.d.).
- **Illicit Drugs:** A drug that is unlawful to possess or use (Hart & Ksir, 2015).
- **Prescription Drugs:** Prescribed by a doctor, bought at a pharmacy, and are prescribed for and intended to be used by one person (United States Food and Drug Administration [FDA], 2015).

Research Questions for Chapter 2 (Study 1 – Literature Review)

Research Question 1: What is the prevalence of alcohol mixed with energy drink consumption among college students and does it differ by demographics (gender, age, race, athletics, field of study, year in school, enrollment status, and fraternity or sorority membership)?

Research Question 2: What is the association between alcohol mixed with energy drink consumption and health (alcohol, illicit drug use, nutrition, sleep, mental health, and sexual consequences)?

Research Question 3: What is the association between alcohol mixed with energy drink consumption and academics (GPA, class attendance, turning assignments in on time, and tardiness).

Research Question 4: Based on traditional research standards (sample selection and size, response rate, survey administration, validity [internal & external] and reliability) what level of scientific rigor did the researchers employ when publishing their studies?

Research Question 5: What gaps exist in the literature concerning college students and alcohol mixed with energy drink consumption?

Research Questions for Chapter 3 (Study 2 – Energy Drink Expectancies)

Research Question 1: What associations exist between energy drink consumption and health; specifically, alcohol, illicit drug use, sleep, and mental health.

Hypothesis 1.1: Among the college students in the sample population, no associations exist between energy drink consumption and alcohol, illicit drug use, sleep, nor mental health.

Research Question 2: What associations exist between energy drink consumption and academics; specifically, GPA and time management.

Hypothesis 2.1: Among the college students in the sample population, no associations exist between energy drink consumption and GPA nor time management.

Research Question 3: How many reliable and interpretable components, energy drink expectancies, exist from the sample population?

Hypothesis 3.1: In the sample population, no reliable or interpretable components, energy drink expectancies, will exist from the sample population.

Research Question 4: How much variance do the components (energy drink expectancies) account for in predicting energy drink consumption?

Hypothesis 4.1: The components (energy drink expectancies) will account for no variance in predicting energy drink consumption among the college students in the sample population.

Research Question 5: Which component (energy drink expectancy) will be the most influential in predicting energy drink consumption behaviors?

Hypothesis 5.1: The components (energy drink expectancies) will not differ from one another.

Research Question 6: How do energy drink expectancies differ between energy drink users and non-users?

Hypothesis 6.1: Energy drink users and non-users' expectancies will not differ.

Research Question 7: What do energy drink users typically do after consuming an energy drink?

Research Question 8: How quickly do energy drink users consume an energy drink, not including energy shots?

Delimitations

Article 1. The study is delimited to college students in the United States. Therefore, only articles that include U.S. college students, aged 18-25, and published between 2006 and the present year were included.

Article 2. This study focuses on the college student population from the United States aged 18-25. More specifically, the data collected for this study will be from undergraduate college students attending a large public university from the Midwest. No online classes were selected. Additionally, no graduate students participated in the study. Due to the geographical specificity, the research findings cannot be generalized to other universities and colleges. Further, because of the unique nature of the higher education, results cannot be generalized to populations beyond college students, even to their same age counterparts not attending college.

Limitations

Article 1. A specific set of limitations exist when conducting a literature review. While a thorough review of literature was completed, it is still possible that some articles were overlooked and not included. This was be minimized by using multiple search strategies and databases (e.g. web-based search engines and reviewing the reference section of each article to avoid missing any relevant articles). Furthermore, unpublished studies exist, therefore assessing them is not feasible. The heterogeneity of the studies may have prevented making definitive conclusions regarding the research concerning energy drinks. Lastly, the consuming of energy drinks while drinking alcohol (non-mixing of the two) may not have been controlled for in some studies.

Article 2. While efforts were made to avoid limitations, some will inevitably remain. First, the study is a cross-sectional design, therefore causality between the variables cannot be determined. Secondly, self-reported data were collected for this study, which may result in inaccurate recall including under or over reporting. Third, participants may provide socially desirable answers, thus, potentially skewing the results. Finally, participants may not have been able to accurately identify their drinks, due to the lack of a common definition or a set of guidelines for energy drinks.

Conclusion

Despite these limitations, these studies provide information concerning the prevalence of energy drink consumption among college students and the associated outcomes. To reiterate the purpose of the literature review is to summarize the literature, including the content and scientific rigor, as well as identify the gaps in literature. The outcomes will help guide future research and inform practitioners of key epidemiological

trends. The aim of the primary data collection study was to determine the expectancies college students have toward energy drinks, as well as the behaviors and patterns that are associated with the identified expectancies. Motivation for energy drink consumption among college students were identified, which can be used to design interventions to mitigate harmful effects, as well as improve student wellness and academic outcomes.

Summary

This chapter contains detailed information about the scope of the problem as it relates energy drink consumption among college students. Background information was examined including the health impact of energy drinks, the prevalence of energy drink use, associated behaviors of energy drink use, the combination of alcohol and energy drinks, and the economic impact of energy drinks. Further, the purpose of this study, definition of terms, research questions and corresponding hypotheses, delimitations, and limitations were described.

Chapter 2

COLLEGE STUDENTS CONSUMPTION OF ALCOHOL MIXED WITH ENERGY DRINKS: A SYSTEMATIC LITERATURE REVIEW

The initial section of this chapter includes an abstract and an introduction of alcohol mixed with energy drinks, their history, adverse effects, and consumption patterns among college students. The second section of this chapter consists of the methods used to complete a systematic review of the literature. The results section includes a table, which highlights the key findings and methods including reliability and variability measures from each of the respective articles. The chapter concludes with a summary, references, tables, and figures.

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Abstract

The purpose of this review was to summarize the literature concerning college students and energy drink consumption. The inclusion criteria consisted of alcohol mixed with energy drinks consumption among United States college students. The search yielded 35 articles, which were published during or after 2007. For the majority of the studies, response rates and validity measures were not included. Additionally, researchers overwhelmingly relied on convenience samples, self-reported data, and single site samples. Most of the research measured consumption patterns and associated the consequences, with few focusing on theory. Future research needs to be conducted with more scientific rigor. Areas to focus include reporting response rates and validity measures, and using randomized sampling methods with more heterogeneous samples.

Introduction

Substance abuse and misuse research, among college students, has typically focused on alcohol, illicit drug use, and related behaviors. Energy drink consumption is a form of substance use and abuse, although the field of study in this area is in its infancy. Energy drinks are caffeinated beverages which may contain herbal supplements and amino acids. Energy drinks may also be carbonated. These beverages are designed to stimulate the body mentally and physically and include products such as Red Bull®, Monster®, Rock Star®, Amp®, 5-hr Energy®, and other similar beverages. This definition does not include beverages such as coffee, tea, or soda pop (Energy Drink, 2018). Energy drinks debuted in the United States in 1997, with consumption and popularity of the beverages increasing in recent years. The growth of energy drinks and their consumption is evidenced by the wide variety (300+) of energy drinks available and the areas a consumer can purchase an energy drink, from gas stations and grocery stores to campus vending machines (Heckman, Sherry, & Gonzalez De Mejia, 2010). Further, from 2008 to 2012, the energy drink market grew by almost two-thirds (Natural Product Insider, 2013).

College students represent a significant segment of the energy drink market with their 30-day consumption patterns ranging from 22% to 70% depending on the time and where the study was conducted (Gallucci, Martin, Hackman, & Hutcheson, 2016; Pettit & DeBarr, 2011). Further, 82% of college students reported consuming an energy drink at least once in their lifetime and about a third (36.4%) had consumed energy drinks in the past two weeks (Marczinski, 2011). The increase in energy drinks and their use may be due, in part, to the aggressive marketing strategies, which include promises of improved

mood, increased physical and mental performance, and prolonged concentration time. Advertisers direct these strategies towards people who are between 18 and 34 years of age, due to their busy schedules and hectic lifestyles (Heckman, Sherry, & Gonzalez De Mejia, 2010).

The upsurge of energy drink consumption is not without safety concerns, especially when the product it is pre-mixed with alcohol (e.g., Four Loko®). Indeed, the U.S. Food and Drug Administration (FDA) effectively banned the manufacturing and sale of alcoholic energy drinks in 2010 (FDA, 2010). While this is a step in the right direction, mixing energy drinks with alcohol, also known as AmEDs (e.g., RedBull® and vodka, *Jagerbombs* [Jagermeister® and Red Bull®]) remains a common practice among young adults. Approximately a third of college students reported consuming energy drinks during the past month and two-thirds indicated drinking them within the last year (Berger, Fendrich, Fuhrmann & 2013; Patrick, Macuada, & Maggs, 2016). Energy drinks by themselves accounted for roughly 12,000 emergency department visits in 2011, with another 2,600 caused by their combination with alcohol (SAMSHA, 2013). Additionally, 8% of the emergency department visits for energy drinks mixed with alcohol or other drugs resulted in hospitalization of the patient (SAMSHA, 2014).

Additionally, AmEDs have been linked to increased risky behaviors and consequences of their use, including increased risk of dependence tendencies. Of those who have tried or regularly consumed AmEDs, 60% report binge drinking, compared to 28% of non-AmED consumers who binge drink (Marczinski, 2011). This accentuates previous findings, where researchers found that over half of energy drink users do so to drink with alcohol while partying (Malinauskas, 2007). Further, based on agreeability

scales, the motivation to consume AmEDs included the assumed benefit that AmEDs help one “hold their liquor,” the consumer can drink more alcohol if they consume AmEDs, and that AmEDs allow a person to get drunk faster (Marczinski, 2011).

According to Berger (2013), hazardous drinkers, defined as those who suffer from alcohol-related consequences, and more likely to drive under the influence after consuming AmEDs than hazardous drinkers that did not consume AmEDs. AmED users reported driving while under the influence at more than twice the rate of non-AmED users (Woolsey, 2015). Additionally, past-month and past-week analyses indicate those who consumed AmEDs had higher rates of drug use, including marijuana, ecstasy, and ketamine, compared to alcohol only users and non-drinkers (Snipes, 2015). AmED users were also associated with having more unprotected sex after having “too much to drink” (Snipes & Benotsch, 2013). Further, AmED users compared to non-AmED users were found to be more likely to be taken advantage of sexually or to take advantage of someone else sexually (O’Brien, 2008; Snipes, 2014).

While numerous studies on alcohol mixed with energy drinks have been conducted, to date the literature has not been critically reviewed assessing strictly the U.S. college student population. The purpose of this study is to synthesize the research on college students and AmEDs and to identify potential gaps in the literature. More specifically, the prevalence of energy drink consumption among college students, the association between AmED consumption and deleterious health outcomes, as well as link between AmED consumption and academics will be summarized. Further, a critical analysis of the level of scientific rigor used to conduct the research on AmEDs is a focal point of this inquiry.

Methods

The articles included in the review were limited to studies conducted in the United States, with study populations of college students between 18 and 25 years old. In addition, articles published prior to 2006 were not included unless they were deemed seminary studies. This is due to the lack of research on the topic prior to 2006. International studies were excluded from this analysis as laws and restrictions on energy drinks in other countries could differ from the United States, which could significantly influence consumption rates and perceptions

The search for this literature review included determining the inclusion/exclusion criteria, identifying keywords, and utilizing specific databases. Databases searched included Academic Search Complete, ERIC, Medline, OhioLINK, ProQuest Dissertations, PsychInfo, PubMed, Web of Science, and Google Scholar. Key terms for the search included energy drinks, college students, alcohol, AmED, as well as other iterations of the terms and combinations with one another. In addition, the reference list of each article was reviewed to determine if other studies should be included in the review.

An initial assessment of all study titles to determine eligibility for inclusion was conducted. If a study was considered eligible, the abstract was reviewed. The full-text article was obtained and reviewed if the information in the abstract aligns with the focus of the present study. The studies were entered into a table that includes the author and year, purpose, study design, location, number of sites where data were collected (e.g., universities), sample size, methods, reliability, validity, main results, and limitations. To augment the search and to ensure interrater reliability, the co-authors reviewed each of

the articles for inclusion and exclusion criteria and corroborated the critique of the various articles.

Results

Figure 1 represents the study selection process. Of the 164 articles identified in the literature search, 60 were excluded by title review. Following the abstract review, 61 articles were excluded because they did not comprise of US college undergraduate students between 18 and 25 or were not relevant. Forty-three full-text articles were reviewed, eight of which were removed because non-college students were sampled or the topic was not relevant to the focus of the study. All included articles were published during 2007 or thereafter, because that is when the first studies on the topic were published. The final number of articles included for systematic analysis was 35.

Study purpose, design, location, target population, sample size, response rate, and validity and reliability are depicted in Table 1. The 35 articles included a fairly homogeneous trend of study designs: 29 were cross-sectional (83%), five were longitudinal (14%), and one was experimental (3%). Researchers from the various studies used the following sampling techniques: 19 convenience sampling (54%), nine random sampling (26%), three stratified random sampling (8%), two cluster sampling (6%), one probability sampling (3%), and one used a combination of a convenience and stratified, random sampling (3%). Data collection methods were mainly survey-based, with 19 utilizing web-based questionnaires (54%) and nine using pencil-paper questionnaires (26%). In three of the studies researchers used a daily diary format (9%), two were an observation with survey (6%), one used personal interviews (3%), and one utilized a web-based questionnaire, interviews, and hair and fingernail collection (3%). Response

rates were reported in 17 of 35 studies (46%). The response rates ranged from 19.7% to 98.1%, with an average response rate of 58%. Web-based response rates were on average 23% lower than response rates of studies that were conducted in person. Regarding reliability, authors mentioned that they used standardized instruments in 13 of the studies, Cronbach's alpha levels were reported in 17 of the studies; although, researchers did not always include reliability measures for all of their variables, and in two of the studies no reliability information was included whatsoever. Only one study included Wilcoxon test-retest (3%) with the remaining articles not reporting test-retest measures.

Institution locations were mixed, with six from the Northeast (17%), six from the Midwest (17%), six from the East Coast (17%), five from the Mid-Atlantic (14%), three from the Southeast (9%), three from the Southwest (9%), one from the West Coast (3%), and five that did not list a location (14%). Institution size was fairly homogeneous with 22 of 35 being classified as large (at least 10,000 students), seven were mid-sized, one was a combination of large and small size, one stated the universities were Division III, but did not list size, and four did not delineate any size parameters (The Carnegie Classifications of Institutions of Higher Education, 2014). There were 14 public institutions, one private institution, one study included a public and a private institution, and 19 that did not list public or private classifications.

Target populations varied from ten with undergraduate students in general (28%), seven with first year or freshman students (20%), four used athlete status (11%), three with college students in general (9%), three were college students who used alcohol and caffeine and experienced heavy episodic drinking in the past month (9%), two used undergraduate AmED users (6%), one used college students with past year alcohol use

and typical weekly use of Caffeinated Alcoholic Beverages (CABs, a pre- or self-mixed drink containing any caffeine and alcohol) (3%), one used college drinkers (3%), one used college students who experienced heavy episodic drinking twice in the past month (3%), one used non-smoking females undergraduates who were 21 or older (3%), and one used freshman alcohol drinkers (3%). Study populations ranged from as little as 27 participants in the experimental study, to as large as 4,271 students, with an average of 633 per study.

Regarding funding, 19 studies were federally funded and two received internal funding from the researchers' university, totaling funding for 21 studies (60%). The National Institute of Alcohol Abuse and Alcoholism (NIAAA) (n=15), the National Institute of Drug Abuse (NIDA) (n=6), the National Institutes of Health (NIH) (n=1), and the National Science Foundation (NSF) (n=1) organizations funded this research, with six studies receiving funding from multiple sources. Collectively, funded studies were conducted with more rigor, evidenced by higher average sample sizes, and a greater percentage of reporting response rates and reliability and validity measures. However, non-funded studies had a lower percentage of studies utilizing a convenience sample, by almost 20%. While almost 60% of the studies were funded, there needs to be more funding in order to conduct a study that encompasses a national dataset on the topic.

[Insert Figure 1]

[Insert Table 1]

Measured Outcomes

Table 2 illustrates the measured outcomes, main results, and limitations associated with the studies. Twenty-one of the 35 studies included AmED use or use patterns with

another seven that measured CAB use, 24 measured alcohol use or alcohol use patterns, and 12 measured energy drink or caffeine use. Risky behaviors were measured in 15 of the studies and included topics of drunk or high-risk driving, drug/substance use, misuse of prescription drugs, tobacco use, heavy episodic/binge drinking, location of drinking, risky drinking activities, sexual behavior, and general risk taking. Alcohol consequences were measured in 18 studies, which included short and long-term consequences, including alcohol dependence and Spring Break related problems. Consequences of AmED and ED use were measured by nine studies, which included sleep problems, general side effects, sexual victimization, effects of AmED use on alcohol behaviors, and general short and long-term consequences and outcomes. Personality traits were measured in 12 of the studies including depression symptoms, athlete status, social context of drinking, impulsivity, AmED attitudes, AmED perceived norms, AmED beliefs, jock identity, masculine norms, activity involvement, living situation, academic demands, Theory of Planned Behavior variables, and general personality traits. Personal motives were measured in 12 of the studies including reasons for CAB use, motivations and reasons for energy drink use, alcohol expectancies, caffeine expectancies, AmED expectancies, CAB expectancies, motivations and reasons for AmED use, and alcohol motives. Neuropsychologic Assessment was measured in one study, and nutrition knowledge was measured in another.

[Insert Table 2]

Key Findings

Much of the research conducted was focused on epidemiologic findings, particularly the association between energy drink consumption and the related

consequences. Past 30-day AmED consumption ranged from as low as 11% to 32% (Poulos & Pasch, 2016; Snipes et al., 2015). Further, lifetime AmED consumption ranged from just under 40% up to 75% (Berger et al., 2013; Woolsey, 2010a). Men appear to be as much as twice as likely to consume AmEDs than women (Miller, 2008; Poulos & Pasch, 2016; Velazquez et al., 2012; Woolsey et al., 2015). Moreover, those who were white held significantly higher rates of AmED consumption (O'Brien et al., 2008; Velazquez et al., 2012). Alcohol users and energy drink users were also at a higher likelihood to consume AmEDs. The rates of energy drink users who consumed AmEDs in the past year were as high 71% (Arria et al., 2016). Further, those who consumed EDs in the past month were nearly two times as likely to consume AmEDs, than those who did not consume EDs (Velazquez et al., 2012). Rates of alcohol users who consumed AmEDs in the past month ranged from 24% to 30%, with one study reporting 78% of alcohol users have tried or use regularly use AmEDs (Marczinski, 2011; Obrien et al., 2008; Snipes & Benotsch, 2013).

AmED users were more likely than alcohol only users to participate in high-risk drinking (Arria et al., 2016; Marzell et al., 2014; Patrick et al., 2014). These measures included past 30-day number of days drinking, number of days drunk, and number of heavy drinking episodes among others (Woolsey et al., 2015). More specifically, 70% of those who have tried or currently consume AmEDs report high-risk drinking, compared to 28% of non-AmED users (Marczinski, 2011). Past-year hazardous drinkers who consumed AmEDs were more like to drive a car under the influence than those who were hazardous drinkers and did not consume AmEDs (Berger et al., 2013). AmED consumers were more likely than non-AmED consumers to drive while knowing they have had too

much to drink, believing they were over the legal limit, and riding with a driver who was under the influence (O'Brien et al., 2008; Woolsey et al., 2015).

Aside from binge drinking or drunk driving, AmED use is also commonly associated with risk taking behaviors, sexual, physical, and academic consequences (Haas et al., 2017; Marzell et al., 2014; Miller, 2008; Woolsey, 2010a). For instance, past month and past week AmED users had higher rates of drug use, including marijuana, ecstasy, and ketamine, than alcohol only users and non-drinkers (Snipes et al., 2013). Further, AmED consumers are more likely than non-AmED consumers to be taken advantage of sexually, to take advantage of someone else sexually, to being hurt or injured, or require medical treatment (O'Brien et al., 2008). Lastly, AmED users were more likely than non-AmED or low frequency AmED users to report academic consequences (Haas et al., 2017; Marzell et al., 2014).

Reasons for energy drink consumption varied, with a common theme among ED users to drink with alcohol while partying (Hardy et al., 2017; Malinauskas et al., 2007). Some other common reasons for consuming AmEDs were that it tastes good, to hide the flavor of alcohol, drink less and get drunk, to not feel as drunk, and to provide an energy boost (Cobb et al., 2015; O'Brien et al., 2008; Poulos & Pasch, 2016). When comparing men to women, men were more likely to report other reasons, including "I can party longer," "relaxation," and, "I can drink more alcohol and not feel as drunk" (Poulos & Pasch, 2016).

While some researchers' analyzed motivations and personality traits linked to energy drinking consumption, only a few utilized theoretical constructs to further examine the behavior. Of note, students whose alcohol use contained a high proportion of

AmEDs held more positive expectancies than those who did not use AmEDs as often and those who held negative beliefs in regards to AmEDs (Mallett et al., 2014; Varvil-Weld et al., 2013). Further, following the examination of “avoidance of negative consequences” (Linden-Carmichael et al., 2015, p. 39) expectancy, it was found that students consumed energy drinks thinking it would keep them more alert (e.g., harm reduction); however, it turns out they were less likely to employ other protective strategies, consumed more CABs, and experienced more negative consequences. In the same study researchers found, somewhat unexpectedly, that intoxication enhancement expectancy (i.e., more intense euphoric feeling), was not found to be a significant mediator between CAB use and experiencing harm (Linden-Carmichael et al., 2015). In another study, the constructs behavioral intention and attitude from the Theory of Planned behavior were significant predictors of AmED use (Reddy, 2014).

Discussion

Energy drinks have become more prevalent since their introduction to the U.S. market two decades ago. Since that time, there have been numerous emergency room visits and hospitalizations due to energy drink and AmED consumption. While literature reviews exist on AmEDs, none were focused exclusively on the college student population. It is important to summarize the research conducted specifically with college students due to the popularity of AmEDs with this group and the aggressive marketing practices directed at them (Heckman, Sherry, & Gonzalez De Mejia, 2010). The search criteria for the present review yielded 35 articles that examined college students and AmEDs, the associated behaviors of using AmEDs, motivations of using AmEDs, and consequences of using AmEDs. The earliest study was published in 2007, with a large

majority of the studies published from 2013 onward. The increasing number of studies may be indicative of the growing concern of AmED consumption and the related consequences college students experience. The studies purpose, design, location, target population, sample size, response rate, validity and reliability, measured outcomes, main results, and limitations were queried. Additionally, studies were analyzed based on scientific rigor and categorized topically.

Topical areas of the assessed articles were widespread. While the majority of the articles included information on the consumption patterns of AmEDs, EDs, and alcoholic drinks, a variety of other variables were studied. For example, researchers examined the risky behaviors associated with consuming energy drinks, such as the co-consumption of alcohol and drugs, drunk driving, as well as the risk factors for becoming dependent on psychotropic substances. Further, self-reported side-effects of use of EDs and AmEDs were also studied by several researchers and included measures of anxiety, sleep disturbance, and sexual victimization. To a lesser degree, personality traits, including jock identity, reasons or motivations for use, and impulsivity and craving were also examined. Gaps in the literature included a lack of qualitative research focused on the reasons for consumption. Further, more research is needed in longitudinal and experimental designs, with a specific focus on interventions aimed at lowering AmED consumption. Lastly, theoretical constructs, for the most part, were not utilized widely. Theory-based research can lead to answering questions specific to attitudes, assumptions, and motivations that impact AmED use. These answers are vital for impacting use and progressing with prevention strategies.

Key findings from the review show prevalence rates vary, with past 30-day AmED use ranging from 11% to almost a third (Poulos & Pasch, 2016; Snipes et al., 2015). Further, being male, white, a current energy drink user, or a current alcohol user are associated with higher rates of energy drink consumption (Arria et al., 2016; Marczynski, 2011; Miller, 2008; O'Brien et al., 2008; Poulos & Pasch, 2016; Snipes & Benotsch, 2013; Velazquez et al., 2012; Woolsey et al., 2015). AmED users are more likely than alcohol-only users to participate in high-risk drinking behaviors, with more than double the rate of AmED users reporting binge drinking than non-AmED users (Arria et al., 2016; Marczynski, 2011; Marzell et al., 2014; Patrick et al., 2014). AmED use is also associated with drunk driving, drug use, a higher likelihood of being injured or requiring medical attention than non-AmED users, and academic consequences (Berger et al., 2013; Haas et al., 2017; Marzell et al., 2014; O'Brien et al., 2008; Snipes et al., 2015; Woolsey et al., 2015). The most common reasons for consuming AmEDs were for the taste, to not feel as drunk, to provide an energy boost, or to party longer (Cobb et al., 2015; O'Brien et al., 2008; Poulos & Pasch, 2016).

Overall, the studies were conducted with varying degrees of rigor. Most of the researchers used cross-sectional design (83%) to conduct their studies, which does not allow for the examination of cause and effect relationships involving AmEDs. A convenience sample was used in approximately half of the studies (54%), and none of the studies drew participants from a national sample, thus limiting the generalizability of the results. While the response rates were typically over 50%, only half of the articles included such information. Incidentally, 80% of the web-based questionnaires yielded responses in which fewer than half of the sample participated. Indeed, questionnaires that

were administered in person had an average response rate that was approximately 23% higher than those administered online. These findings are consistent with past research, as web-based surveys generally elicit a lower response rate than those that are administered in person (Nulty, 2008). Validity and reliability testing were reported in more than half of the studies (53%), with two-fifths (41%) using a standardized instrument. Overall, the sample sizes obtained by the researchers were adequate, with more than three-quarters of the studies containing more than 300 participants. A total of 21 studies were funded at the federal level (54%) or internally with money from the university (6%). In general, researchers who received funding conducted their research with more scientific rigor than those who did not.

In all types of research there are limitations and a systematic literature review is no exception. Despite the extensive review strategy, some research may have been inadvertently missed. The possibility of this occurring was minimized by employing a diverse search strategy using web-based search engines and reviewing the reference section of each article as well as utilizing multiple key terms for each search. Unpublished studies may exist which could include insightful information, yet assessing them is not feasible. Further, the heterogeneity of the methods (study population, campus size, response rates, and reliability and validity) used in the various studies makes it difficult to provide definitive conclusions regarding the research conducted in this area. Lastly, the consuming of energy drinks while drinking alcohol (non-mixing of the two) may not have been delineated or controlled for in some studies. In other words, the authors in some studies did not discuss or perhaps track whether participants consumed alcohol while also drinking an energy drink (non-alcoholic) versus mixing an energy

drink with alcohol (e.g., “Red Bull® & vodka”). This may be a moot point as alcohol and energy drinks are digested essentially the same either way, then again, the different ways drinks are marketed towards consumers may influence consumption patterns.

In spite of these limitations, the findings from this systematic literature review provide an overall assessment of the research conducted on alcohol mixed with energy drinks and its impact on college students. In sum, the field would benefit from a national data source, which allows researchers to more accurately assess the prevalence of energy drink and AmED use and related issues. College students need education on the health risks and consequences of consuming AmEDs. In particular, additional research needs to be conducted to further parcel out the motivations or expectancies of AmED use and the associations with other substance use. More intervention research needs to be performed utilizing longitudinal research rather than simply describing the problem through the use of cross sectional surveys. Finally, qualitative research would allow researchers to further investigate use patterns, reasons of use, and the assumptions surrounding energy drink and AmED use.

While energy drinks have only been in the US for a relatively short period of time, and AmEDs even less, there are serious negative consequences associated with their use, including higher rates of binge drinking, more frequent alcohol use, and increased rates of drunk driving. Based on the results from this literature review, future research needs to be executed with more scientific rigor. Areas to focus on include utilizing randomized sampling methods, collecting and reporting of response rates, and reporting reliability and validity measures. Journal editors, reviewers, and grant funders must uphold high research standards to ensure confidence in the results of the various studies.

It is crucial to assess energy drink consumption utilizing a representative national sample. Perhaps energy drink survey items could be added to nationally recognize standardized instruments such as the National College Health Assessment II or the Core Alcohol and Drug Survey so universities can make comparisons regarding the prevalence of AmEDs and energy drink consumption (American College Health Association, 2016; Southern Illinois University – Carbondale & Core Institute, 2017). Qualitative studies are needed to assess why students engage in AmED use. Additionally, longitudinal and experimental designs centered on intervention tactics are also needed to determine what methods are effective in curbing AmED use. As evidenced by the results of this review, funding positively impacts the scientific rigor researchers employ with their studies; therefore, increased funding is necessary to ensure more sophisticated study designs are utilized when researching AmEDs. Further, advocacy for changes at the state level should be initiated, which could include a new policy requiring energy drink cans or bottles to have warning labels that deter mixing of alcohol with energy drinks. Moreover, limiting availability, more specifically implementing policies that restrict the consumption of AmEDs at bars and restaurants are fundamental steps to address this issue. Students need education concerning the health hazards associated with mixing alcohol with energy drinks. This could be accomplished through presentations during campus orientation and/or first year experience courses as well as through health communication campaigns. Finally, AmED use and the severity of the associated consequences warrant greater recognition and attention by university officials. Equipping practitioners with the knowledge and skills necessary to help prevent this behavior will enhance wellness and perhaps academic outcomes among college students.

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Figure 1. Article Inclusion

Table 1								
<i>Study Design and Characteristics</i>								
<u>Author & Year</u>	<u>Purpose</u>	<u>Study Design</u>	<u>Study Location</u>	<u>Target Population</u>	<u>Sample Size</u>	<u>Response Rate</u>	<u>Validity & Reliability</u>	<u>Notes</u>
Arria, 2016	1) Describe patterns of ED consumption, focusing on estimating the prevalence of ED consumption with and without alcohol. 2) Examine how ED consumption patterns explained the variance in drunk driving behavior after taking alcohol use patterns and several background risk factors into account.	<ul style="list-style-type: none"> • 10-year prospective longitudinal. • Interview. • Convenience sample. • Data captured in year 6. 	<ul style="list-style-type: none"> • Large public university. • Mid-Atlantic. 	<ul style="list-style-type: none"> • 6th year following students since freshman year. • Ages 23-25 	1,000	80.00%	N/A	No validity or reliability was reported, however the measures used were cited from previous research.
Berger, 2013	1) Estimate AmED use prevalence, including pre-mixed AmED use, before the FDA ban on pre-mixed AmEDs. 2) Examine the associations among AmED use, hazardous drinking, and multiple alcohol-related negative consequences.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Interview. • Hair and fingernail collection for a direct alcohol biomarker. • Probability sample. 	<ul style="list-style-type: none"> • Large public university. • Urban metropolis in the Midwest. 	<ul style="list-style-type: none"> • Undergraduate students. • Ages 18-25. 	606	54.00%	N/A	No validity or reliability was reported, however the measures used were cited from previous research.
Bonar, 2017	Examine links among AmED use, depression symptoms, and sleep problems among college student drinkers.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sampling. 	<ul style="list-style-type: none"> • Large, public university. • Midwest. 	<ul style="list-style-type: none"> • Undergraduate students. • 18 and older. 	560	N/A	N/A	No validity or reliability was reported, however the measures used were cited from previous research.
Cobb, 2015	1) Track the use patterns of alcohol combined with different caffeine additives. 2) Compare CAB users and those who drank alcohol alone. 3) Compare drinking characteristics and reasons for CAB use based on the type of beverage consumed.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • Large, urban university. • Mid-Atlantic. (30,000+) 	<ul style="list-style-type: none"> • Undergraduate students. • 18 and older. 	1,174	N/A	N/A	No validity or reliability was reported, however the measures used were cited from previous research.

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Curry, 2009	Examine the neuropsychological performance after consuming a beverage containing caffeine and alcohol.	<ul style="list-style-type: none"> • Double-blind, placebo controlled experimental. • Observation and survey. • Random-sample. 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • Non-smoking. • Female college students. • 21 years or older. 	27	N/A	RBANS: Immediate memory .84, Delayed memory .84, Visuospatial/constructural .77, Attention .84, and Language .75.	N/A
Gallucci, 2016	1) Explore the differences in ED consumption and motivations of ED use, based on athlete status. 2) Identify potential ED associations.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Cluster sample. 	<ul style="list-style-type: none"> • Large, private university. • Southwest. 	<ul style="list-style-type: none"> • Undergraduate students. • Varsity athletes and non-athletes. • Ages 18-25. 	205 athletes. 487 non.	98.10%	N/A	No validity or reliability was reported, however the measures used were cited from previous research and were reviewed by content and survey design experts, as well as pilot tested by a small sample of college students.
Haas, 2017	Understand how AmEDs impact problematic drinking.	<ul style="list-style-type: none"> • Cross-sectional: Web-based and paper-pencil survey. • Convenience and a cluster sample. 	<ul style="list-style-type: none"> • Two independent Northern California universities. • Site 1, large, urban, public university. • Site 2, small, private university. 	<ul style="list-style-type: none"> • Undergraduate students. • Reported AmED use in the past three months. 	458	N/A	Young Adult Alcohol Consequences Questionnaire, Cronbach's (YAACQ): Academic: .74 Blackout Drinking: .79 Impaired Control: .70 Physiological Dependence: .44 Risky Behavior: .69 Social Consequences: .68 Self-perception: .72 Impairments in Self Care: .80 Alcohol Use Disorders Identification Test (AUDIT): .80	No validity or reliability was reported for other measures; however, they were cited by previous research.

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Hardy, 2017	Identify the relationships among ED consumption, nutrition knowledge, and socio-demographic characteristics among Division III student-athletes.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Cluster sample. 	<ul style="list-style-type: none"> • 5 NCAA D-III colleges and universities. • Upper Midwest. 	<ul style="list-style-type: none"> • Undergraduate varsity athletes. • 18 and older. 	194	19.70%	Cronbach alpha, .74 for overall score	N/A
Lau-Barraco, 2014a	1) Examine how predictive caffeine and alcohol expectancies are in regards to CAB use outcomes including CAB use quantity and frequency, and alcohol-related problems. 2) Explore and compare the influence of alcohol versus caffeine expectancies in explaining CAB consumption.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, urban university. • East coast. 	<ul style="list-style-type: none"> • College students. 18 to 25. • <1 alcoholic beverage per week. • <1 caffeinated beverage per week. 	419	N/A	Comprehensive Effects of Alcohol: IC, .95 Caffeine Expectancy Questionnaire: IC, .93 Young Adult Alcohol Consequences Questionnaire: IC, .93	No validity or reliability was reported for the Daily Drinking Questionnaire; however, it is cited by previous research.
Lau-Barraco, 2014b	1) Identify categories of CAB users. 2) Examine differences between categories on measures that include the severity of alcohol and caffeine use. 3) Examine differences between categories with regards to caffeine and alcohol expectancies.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, university. • East coast. 	<ul style="list-style-type: none"> • College students. • 18 to 25. • Alcohol consumption at least once in the past 12 months. • Consume CABs at least once during a typical week. 	583	N/A	Alcohol Expectancy Questionnaire: IC, .66 to .86 Caffeine Expectancy Questionnaire: IC, .84 to .91 Alcohol Use Disorders Identification Test: .82 Caffeine Dependence and Withdrawal Checklist: Dependence, .83 and Withdrawal, .82	No validity or reliability was reported for the Daily Drinking Questionnaire; however it is cited by previous research.

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Linden-Carmichael, 2015	To test different types of CAB-specific expectancies as mediators in a model that include CAB use, CAB-specific expectancies, use of Protective Behavioral Strategies, and alcohol-related problems.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, university. • East coast. 	<ul style="list-style-type: none"> • College drinkers. 	322	N/A	Caffeine plus Alcohol Combined Effects Questionnaire: Intoxication enhancement, .80 and avoidance of negative consequences, .84 Protective Behavioral Strategies Survey, .85 Young Adult Alcohol Consequences Questionnaire, .93	No validity or reliability was reported for the Daily Drinking Questionnaire; however it is cited by previous research.
Linden-Carmichael, 2016	1) Identify the prevalence of Spring Break CAB use. 2) Determine how college students' CAB use differs from their normal use and whether they vacationed during Spring Break. 3) Examine the relationship between CABs used during Spring Break and negative consequences.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, university. • East coast. 	<ul style="list-style-type: none"> • College students. • 18 to 25. • Heavy episodic drinking at least twice in the past month. 	95	N/A	N/A	No validity or reliability was reported, however the measures used were cited from previous research.
Linden-Carmichael, 2017a	1) Examine the social and environmental characteristics of AmED use, comparing days where they used AmEDs and days they did not use AmEDs. 2) Examine the impact of drinking contexts associated with AmED use.	<ul style="list-style-type: none"> • Cross-sectional. • 14-day daily diary. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, public university. • East coast. 	<ul style="list-style-type: none"> • College students. • 18 to 25. • Consumed caffeine mixed with alcohol in past week. • Heavy episodic drinking in past month. • Daily internet access. 	122	N/A	N/A	No validity or reliability was reported.

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Linden-Carmichael, 2017b	1) Compare days mixing any type of caffeine with alcohol was reported. 2) Test the impact of the caffeine mixer by comparing mixed and non-mixed days on drinking outcomes.	<ul style="list-style-type: none"> • Cross-sectional. • 14-day daily diary. • Convenience sample. 	<ul style="list-style-type: none"> • Public university. • East coast. 	<ul style="list-style-type: none"> • College students. • 18 to 25. • Consumed caffeine mixed with alcohol in past week. • Heavy episodic drinking in past month. • Daily internet access. 	122	N/A	The Barratt Impulsiveness Scale, Cronbach's of .85. Brief Young Adult Alcohol Consequences Questionnaire, Cronbach's of .90.	N/A
Linden-Carmichael, 2017c	1) Determine which motives were associated with the odds of using AmEDs. 2) Compare the relationships between drinking motives measured daily and at baseline predicting daily AmED use, in order of determining which motives were more noticeable in predicting AmED use.	<ul style="list-style-type: none"> • Cross-sectional. • 14-day daily diary. • Convenience sample. 	• N/A	<ul style="list-style-type: none"> • College students. 18 to 25. • Consumed caffeine mixed with alcohol in past week. • Heavy episodic drinking in past month. • Daily internet access. 	122	51.50%	N/A	No validity or reliability was reported for other measures; however, they were cited by previous research.
Malinauskas, 2007	1) Determine ED use patterns. 2) Determine prevalence and frequency of ED use for different situations or reasons, including insufficient sleep, to increase energy, while studying, driving for long periods, drinking with alcohol while partying, and to treat a hangover. 3) Determine the prevalence of adverse side-effects and ED use dose-effects.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Random sample. 	<ul style="list-style-type: none"> • Rural, public university. • Mid-Atlantic. 	• College students.	496	N/A	N/A	Questionnaire was designed after focus groups totaling 32 students. No validity or reliability was reported.

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Mallett, 2014	1) Identify specific risk-profiles using both AmED use and alcohol-only use. 2) Compare the AmED risk-profiles with regard to AmED expectancies, attitudes, and norms. 3) Compare the AmED risk-profiles with regard to the amount and different types of alcohol-related consequences.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Random sample. 	<ul style="list-style-type: none"> • Large university. • Northeast. 	<ul style="list-style-type: none"> • Undergraduate students. 	195 AmED users.	51.00%	AmED Expectancies, Cronbach's, .71 AmED Attitudes, Cronbach's, .79 Young Adult Alcohol Problems Screening Test, Cronbach's, .88	No validity or reliability was reported for other measures; however, they were cited by previous research.
Mallett, 2015	1) Examine differences in AmED use patterns between the first and second years of college. 2) Examine differences in the rates of high-risk drinking behaviors and consequences.	<ul style="list-style-type: none"> • Longitudinal: Web-based survey. • 6-month follow-up. • Random sample. 	<ul style="list-style-type: none"> • Large, public university. • Northeast. 	<ul style="list-style-type: none"> • Freshman college students. • Alcohol users. 	1,710	N/A	Daily Drinking Questionnaire: Time 1: .76 Time 2: .77 AmED DDQ Adaptation: Time 1: .79 Time 2: .77 Young Adult Alcohol Consequences Questionnaire, Cronbach's, .92	N/A
Marczinski, 2011	Examine consumption habits and motivations for using AmEDs.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • Public university. • Southeast. • 12,000 	<ul style="list-style-type: none"> • Undergraduate students. 	706	58.00%	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Marzell, 2014	Examine differences in attitudes, beliefs, and normative perceptions of AmEDs among students who use AmEDs compared to students who consume only alcohol.	<ul style="list-style-type: none"> • Longitudinal: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • Large, university. • Northeast. 	<ul style="list-style-type: none"> • First year college students. 	386	75.40%	Beliefs, Cronbach's, .78 Alcohol-related consequences, Cronbach's, .60 to .75	No validity or reliability was reported for other measures; however, they were cited by previous research.

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Miller, 2008	Examine gender links among sport-related identity, endorsement of masculine norms, risk-taking behaviors, and ED use.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • Large, public university. • Northeast. 	<ul style="list-style-type: none"> • Undergraduate students. 	795	53.00%	Jock Identity: .94 12-Item Playboy subscale: .88 Winning subscale: .81 Dominance subscale: .69 10-item risk taking subscale, .84 10-item Risk-Taking Behavior scale: .57 8-item violence subscale, .81 Masculine Norms scale, .67	N/A
O'Brien, 2008	Investigate the relationship between ED use, high-risk drinking behavior, and alcohol-related consequences.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Stratified, random sample. 	<ul style="list-style-type: none"> • 10 universities. • North Carolina. • Southeast. 	<ul style="list-style-type: none"> • Undergraduate students. 	4271: Target of 365 per school.	N/A	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Patrick, 2014	Investigate the association between past-month AmED, alcohol-related consequences, alcohol-related problems symptoms, and alcohol-related accidents for two years.	<ul style="list-style-type: none"> • Longitudinal: Web-based survey. • Stratified, random sample. 	<ul style="list-style-type: none"> • Large, public, university. 	<ul style="list-style-type: none"> • Freshman college students. 	544-620	66.00%	Rutgers Alcohol Problem Index: .90	No validity or reliability was reported for other measures; however, they were cited by previous research.
Patrick, 2016	Examine the characteristics of AmED use. Specifically, socio-demographics, extra-curricular activity involvement, academic demand, and drinking motives.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Stratified, random sample. 	<ul style="list-style-type: none"> • Large, university. • Northeast. 	<ul style="list-style-type: none"> • Freshman college students. • Under 21 years old. 	614	N/A	Importance of Consequences of Drinking (ICOD) short form, Cronbach, .87 to .92	No validity or reliability was reported for other measures; however, they were cited by previous research.
Poulos, 2016	Examine characteristics of current ED users and AmED users to better understand ED use behaviors overall.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Random sample. 	<ul style="list-style-type: none"> • Large, public university. • Southwest. 	<ul style="list-style-type: none"> • First year college students. 	603	20.30%	N/A	No validity or reliability was reported, however the measures used were cited by previous research.

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Reddy, 2014	1) Examine which constructs from the Theory of Planned Behavior predict alcohol mixed with energy drink (AmED) consumption. 2) Estimate the prevalence and explain correlates of AmED consumption.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • Large, public university. • Southeast. 	<ul style="list-style-type: none"> • Undergraduate students. • Ages 18-24. 	605	43% of instructors agreed (19/44)	Cronbach's for Theory of Planned Behavior subscales: Attitudes .942, Subjective norms .733, Behavioral intentions, .70, and Perceived behavioral control .922.	
Snipes, 2013	1) Examine the relationship between AmED use and drug use. 2) Examine the association between AmED use and high-risk sexual behavior.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience. 	<ul style="list-style-type: none"> • University. • Southeast. 	<ul style="list-style-type: none"> • Undergraduate students. 	549-624	45.60%	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Snipes, 2014	1) Examine the association between AmED use and sexual victimization.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Convenience sample. 	<ul style="list-style-type: none"> • University. • Mid-Atlantic. 	<ul style="list-style-type: none"> • College students. 	798	N/A	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Snipes, 2015	Describe associations between AmED use and alcohol dependence patterns.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • University. • Mid-Atlantic. 	<ul style="list-style-type: none"> • Undergraduate students. • Ages 18-25. 	757	N/A	Substance Use Risk Profile Scale (SURPS) subscales Cronbach's: Hopelessness .84, Anxiety sensitivity .68, Impulsivity .70, and Sensation seeking .68.	No validity or reliability was reported for other measures; however, they were cited by previous research.

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Stamates, 2017	1) Determine the impact of environmental context on craving ratings for alcohol and CABs. 2) Test inhibitory control as a mediator between the association of context and craving. 3) Examine associations between impulsivity and craving for alcohol and CABs.	<ul style="list-style-type: none"> • Cross-sectional • Observational. • Convenience sample. 	<ul style="list-style-type: none"> • Mid-sized, university. • East coast. 	<ul style="list-style-type: none"> • Undergraduate students. • 18-25. • Having consumed any caffeinated alcohol in the past 30 days. • No history of seizures. • Normal color vision, and normal/corrected to normal vision. 	143	N/A	Daily Drinking Questionnaire (DDQ): .78, Barratt Impulsiveness Scale: .73, Alcohol Urge Questionnaire (AUQ): .89 for alcohol-only craving and .84 CAB craving at baseline; .85 for alcohol-only craving and .84 for CAB craving at second time point.	No validity or reliability was reported for other measures; however, they were cited by previous research.
Varvil-Weld, 2013	1) Identify risk-profiles of college students based on AmED constructs including expectancies, attitudes, and norms. 2) Examine the longitudinal associations between AmED use, alcohol use, and consequences.	<ul style="list-style-type: none"> • Longitudinal: Web-based survey. • 6-month follow-up. • Random sample. 	<ul style="list-style-type: none"> • Large, public university. • Northeast. 	<ul style="list-style-type: none"> • Incoming freshman college students. 	387	75.40%	AmED Expectancies: .90.	No validity or reliability was reported for other measures; however, they were cited by previous research.
Velazquez, 2012	Explore associations between ED use and alcohol use.	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Random sample. 	<ul style="list-style-type: none"> • Large, public university. • Southwest. 	<ul style="list-style-type: none"> • Incoming freshman college students. 	603	20.30%	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Woolsey, 2010a	1) Examine patterns of alcohol use, combined use, and ED use among student athletes. 2) Investigate the differences within combined users on risk taking and consequences when comparing alcohol-only to combined use.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Random sample. 	<ul style="list-style-type: none"> • Large, D-1 university. • Midwest. 	<ul style="list-style-type: none"> • College athletes. 	401	87.90%	Cronbach's, Risk taking .726, and Consequences .737.	No validity or reliability was reported for other measures; however, they were cited by previous research.

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Woolsey, 2010b	1) Measure alcohol, ED, and combined use of student athletes. 2) Compare reported risk-taking and consequences, between alcohol-only and combined use.	<ul style="list-style-type: none"> • Cross-sectional: Survey. • Random sample. 	<ul style="list-style-type: none"> • Large, D-1 university. • Midwest. 	<ul style="list-style-type: none"> • College athletes. 	401	87.90%	N/A	No validity or reliability was reported, however the measures used were cited by previous research.
Woolsey, 2015	Compare risky driving behaviors and high-risk drinking behaviors between AmED users and alcohol-only users	<ul style="list-style-type: none"> • Cross-sectional: Web-based survey. • Convenience sample. 	<ul style="list-style-type: none"> • Large, university. • Midwest. 	<ul style="list-style-type: none"> • College students. 	549	N/A	Wilcoxon test-retest, QDS = .92.	No validity or reliability was reported for other measures; however, they were cited by previous research.

Table 2 <i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Arria, 2016	<ul style="list-style-type: none"> • Drunk driving frequency. • ED consumption patterns. • Alcohol use patterns. • Caffeine consumption. • Suspected risk factors for drunk driving. 	<ul style="list-style-type: none"> • 57% lifetime energy drink (ED) consumption. • 40% lifetime alcohol mixed with energy drink (AmED) use. • 71% of ED users drank AmEDs. • Drunk driving frequency correlated with ED consumption (with and without alcohol), and quantity/frequency of alcohol use. • Indirect path from AmED use to drunk driving, with alcohol quantity as the mediator. 	<ul style="list-style-type: none"> • Not generalizable. • Self-reported data. • Cross-sectional design. • Did not ask participants to explain "drove while drunk." From this, participants may not have mentioned times they drove while "tipsy" or "buzzed" but were not subjectively drunk. • Did not ask participants about consuming EDs when they drove drunk. Cannot draw conclusions about whether ED consumption contributed to them driving drunk.
Berger, 2013	<ul style="list-style-type: none"> • AmED Use. • Alcohol Use. • Alcohol-related negative consequences. 	<ul style="list-style-type: none"> • 75% lifetime AmED use (mixed and pre-mixed). • 65% past-year AmED use. • Majority of lifetime and past-year AmED use were mixed (e.g., Red Bull® and vodka) versus pre-mixed (e.g., Four Loko®). • Hazardous drinkers, who used AmEDs, were more likely to drive a car under the influence or have unprotected sex, than hazardous drinkers who do not use AmEDs. • Hazardous drinkers, who consumed AmEDs, had the highest AUDIT-C scores. 	<ul style="list-style-type: none"> • Cross-sectional design. • Not generalizable. • Partner type was not assessed in terms of unprotected sex (e.g., casual partner).
Bonar, 2017	<ul style="list-style-type: none"> • AmED Use. • Alcohol Use. • Alcohol Use Disorders Identification Test-Consumption (AUDIT-C). • Drug Abuse Screening Test (DAST-10). • Patient Health Questionnaire (PHQ-9) for past two-week depression symptoms. • Sleep Problems Scale (SPS). 	<ul style="list-style-type: none"> • 32.4% of drinkers used AmEDs in the past three months. • 81% of students who used AmEDs reported they usually consumed one ED (although not necessarily mixed), 14.5% consumed two, and 4.5% consumed three or more. • AmED users had higher scores of sleep problems and depressive symptoms than that of non-users. • AmED users reported higher alcohol use severity scores and drug severity scores compared to non-users. 	<ul style="list-style-type: none"> • Cross-sectional design. • Retrospective, self-reported data. • Convenience sample. • Not generalizable • AmED use was asked about in general, rather than a specific time. This may not capture current or future patterns in use. • Newly developed AmED use measures needs psychometric evaluation.

Table 2*Outcomes, Results, & Limitations*

<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Cobb, 2015	<ul style="list-style-type: none"> • Caffeine consumption. • Alcohol consumption. • Caffeinated Alcohol Beverage (CAB) consumption. • Reasons for CAB consumption. 	<ul style="list-style-type: none"> • Of past 30-day alcohol/caffeine consumers, 68.8% drank either ready to drink AmEDs (50.3%) or self-mixed AmEDs (18.5%) compared to 26.4% who drank caffeinated sodas self-mixed with alcohol. • Most common reason for mixing with caffeinated beverages was to "hide the flavor of alcohol," "drink less and get drunk," "only mixer available," or, "stay alert while drinking." 	<ul style="list-style-type: none"> • Cross-sectional design. • Study was conducted in the fall semester, could have resulted in biased measurements of alcohol drinking behaviors. • Not generalizable. • May not generalize to alcohol-caffeine users who are no longer able to purchase ready-to-drink AmEDs. • Self-reported data. • Social desirability bias.
Curry, 2009	<ul style="list-style-type: none"> • Repeatable Battery for the Assessment of Neuropsychological Status (RBANS): Immediate memory, delayed memory, visuospatial/constructional, attention, and language. 	<ul style="list-style-type: none"> • Consumers of Energy drink plus alcohol (ED+A) scored lower on total RBANS cognitive status scores, visuospatial/construction scores, and language scores than the control group. • ED+A scored significantly lower on overall neuropsychological status; specifically, visuospatial judgments and semantic fluency. 	<ul style="list-style-type: none"> • Large amount of within-group variance from pre- to post-test in the control group. • There was not an alcohol-only group. • Sample was limited to undergraduate women. • Not generalizable. • Drinks used were proprietary blends of premixed ingredients; these ingredients between the two drinks were similar, but not identical.
Gallucci, 2016	<ul style="list-style-type: none"> • ED use. • Athlete status. • Misuse of prescription stimulants • Tobacco use. • Heavy episodic drinking. • Motivations for ED consumption. 	<ul style="list-style-type: none"> • Low-use and high-use non-student athletes reported, "to prolong the effects of alcohol or other substances" as a motivation for consuming EDs. 	<ul style="list-style-type: none"> • Convenience sample from one private university. • Self-reported data. • Cross-sectional design. • Not generalizable. • The sport in which the participants participated in was not listed. • Only consumption of ED was asked, did not account for the different types of EDs, varying levels of caffeine in each ED, nor the consumption of other caffeinated beverages.
Haas, 2017	<ul style="list-style-type: none"> • AmED Use. • Alcohol Use. • Heavy Episodic Drinking. • Alcohol Consequences. • Alcohol-related Problems. 	<ul style="list-style-type: none"> • 38% of overall sample used AmEDs in the past three months. • High-proportion AmED groups (75% or more of all drinking events involved AmED use), compared to low and moderate, scored higher on all five consequence areas (social consequences, risky behaviors, academic difficulties, physiological dependence, and impaired control.) 	<ul style="list-style-type: none"> • Constrained, urban, geographical area. • Convenience sample. • Not generalizable. • Number of days of AmED use was not measured. • Restricted to AmED use and alcohol-related problems.

Table 2*Outcomes, Results, & Limitations*

<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Hardy, 2017	<ul style="list-style-type: none"> • General Nutrition Knowledge Questionnaire (GNKQ). • ED use. • Reasons for consuming EDs. • ED side-effects. 	<ul style="list-style-type: none"> • 18% of ED users' reasoning for ED consumption was, "as a mixer for alcoholic beverages." 	<ul style="list-style-type: none"> • Not generalizable. • Cross-sectional design. • Self-reported data.
Lau-Barraco, 2014a	<ul style="list-style-type: none"> • Alcohol expectancies. • Caffeine expectancies. • Alcohol use. • Caffeine use. • CAB use. • Alcohol-related problems. 	<ul style="list-style-type: none"> • Caffeine and alcohol expectancies variance account for 12% in quantity, 8% in frequency, and 16% in problems. • Alcohol expectancies accounted for 10-11% of the variance of CAB use quantity, caffeine expectancies accounted for 6%. • CAB frequency was 8% alcohol expectancies and 4% caffeine expectancies. • Alcohol expectancies accounted for 12-14% of variance, caffeine expectancies accounted for 4-6% of variance in alcohol related harms. 	<ul style="list-style-type: none"> • Cross-sectional design. • Did not assess the role of CAB-specific expectancies, as the instrument does not exist. • Self-reported data. • No clear, operational, or widely adopted definitions of CABs or AMEDs exist. • Homogeneous sample. • Not generalizable.
Lau-Barraco, 2014b	<ul style="list-style-type: none"> • Alcohol expectancies • Caffeine expectancies • Alcohol use. • CAB use. • Alcohol use problems. • Caffeine use dependence and withdrawal. 	<ul style="list-style-type: none"> • Four classes of drinkers were found: High Alcohol/High CAB (6.0%), High Alcohol/Moderate CAB (5.15%), High Alcohol/Low CAB (22.9%), and Low Alcohol/Low CAB (65.8%). • Low Alcohol/Low CAB class reported the lowest levels of caffeine withdrawal, caffeine dependence symptoms, heavy episodic drinking frequency, and alcohol use problems. • CAB users in the High Alcohol/Low CAB class held more positive alcohol expectancies than those in the Low Alcohol/Low CAB class. • High/Alcohol/High CAB class reported withdrawal symptom caffeine expectancies that were stronger than all other classes. 	<ul style="list-style-type: none"> • Cross-sectional design. • Homogeneous sample. • Not generalizable. • Did not assess CAB-specific expectancies.
Linden-Carmichael, 2015	<ul style="list-style-type: none"> • Alcohol use. • CAB use. • CAB-specific expectancies. • Protective behavioral strategies. • Alcohol-related problems. 	<ul style="list-style-type: none"> • The developed model accounted for 31% of the variance in negative consequences. • Avoiding Negative Consequences expectancies were significantly associated with less application of protective behavioral strategies and greater experiences of harms, while Intoxication Enhancement expectancies was not significantly associated with either. • CAB use was associated with stronger expectations that drinking CABs can help avoid negative consequences. • These assumptions are linked to negative consequences, including failing to protect themselves from harm and previously experiencing alcohol-related problems. Therefore, IE expectancies were not a significant factor in the relationship of CAB use and harms. 	<ul style="list-style-type: none"> • Cross-sectional design. • Self-reported data. • Sample was mostly female, limits generalizability to males. • Did not control for impulsivity.

Table 2 <i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Linden-Carmichael, 2016	<ul style="list-style-type: none"> Alcohol use. CAB use. Spring Break alcohol and CAB consumption. Spring Break alcohol-related problems. Spring Break plans. 	<ul style="list-style-type: none"> 54% of students used CABs during Spring Break CAB use frequency during Spring Break predicted negative consequences, with controlling for other alcohol consumed and whether the participant was on vacation for Spring Break. 	<ul style="list-style-type: none"> Small sample size, due to being a preliminary study. CAB use was based on co-use of alcohol and any caffeine mixers, not just EDs. Majority of the sample was female. Limited generalizability. Cross-sectional research design.
Linden-Carmichael, 2017a	<ul style="list-style-type: none"> AmED Use. Alcohol-only use. Location of drinking. Risky drinking activities. Social context of drinking. 	<ul style="list-style-type: none"> Individuals are more likely to consume AmEDs if they are drinking at home, in a bar or club, or while pre-gaming, but not when playing drinking games. 	<ul style="list-style-type: none"> Cross-sectional design. Sample was mostly women. Limited generalizability. Limited number of days in which AmEDs were consumed. AmED use was examined dichotomously. Social context was measured in a way that limited the researchers ability to make conclusions about whether participants drank AmEDs around others.
Linden-Carmichael, 2017b	<ul style="list-style-type: none"> Impulsivity. Alcohol use. CAB use. Drinking-related outcomes. 	<ul style="list-style-type: none"> AmEDs were consumed on 39.6% of CAB drinking days. Alcohol and soda pop on 57.43% of CAB drinking days. AmED use was associated with heavier alcohol consumption (after controlling for impulsivity) and more alcohol-related harms (after controlling for number of drinks consumed and impulsivity). Regardless of whether the mixer was soda or EDs, participants drank more heavily on days where they mixed with caffeine. 	<ul style="list-style-type: none"> Cross-sectional research design, over two-week period. Limited to examine several consequences of drinking. Limited comprehensiveness of measuring sexual behavior, did not ask about sexual victimization. Low response rate. Not generalizable. The BYAACQ used in this study is not standardized for use in a daily diary study.
Linden-Carmichael, 2017c	<ul style="list-style-type: none"> Drinking motives. AmED use. 	<ul style="list-style-type: none"> Daily conformity motives (e.g., to fit in with people you like) were positively associated with odds of using AmEDs. Daily enhancement motives (e.g., because it gives you a feeling you like) were negatively associated to odds of using AmEDs. None of the drinking motives measured at baseline were associated with AmED use. 	<ul style="list-style-type: none"> The study included only a few AmED days. Self-reported data. Recall of previous night's drinking motives. Not generalizable.

Table 2 <i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Malinauskas, 2007	<ul style="list-style-type: none"> • ED use. • Situations of ED use. • Side effects of maximum number of EDs consumed. 	<ul style="list-style-type: none"> • 54% of ED users consumed EDs to mix with alcohol while partying. • 16% of females and 18% of males consumed EDs to treat a hangover. • Using 3 or more EDs in one sitting was a more common practice among those who used them to drink with alcohol (49% of users). 	<ul style="list-style-type: none"> • Cross-sectional design. • Limited demographic information. • Rural state university and a fairly homogeneous sample. • Not generalizable. • Self-reported data.
Mallett, 2014	<ul style="list-style-type: none"> • Alcohol use. • AmED use. • AmED Expectancies. • AmED Attitudes. • AmED Norms. • Alcohol-related consequences. 	<ul style="list-style-type: none"> • Those whose alcohol use contained higher proportions of AmEDs had significantly higher AmED-related expectancy scores than those with lower proportions of use. • Higher proportion AmED users perceived their friends to drink significantly more AmEDs than lower proportion users. • Moderate drinkers with high proportions of AmED use perceived their friends to be more accepting of AmED use than moderate drinkers with low proportions of AmED use. • High-proportion AmED users reported more alcohol-related consequences than moderate drinkers with low proportions of AmED use. • Heavier AmED users had more favorable cognitive factors related to AmEDs. • Moderate drinkers who use more AmEDs are at a greater risk for more alcohol-related consequences than those who use less AmEDs. 	<ul style="list-style-type: none"> • Only looked at the negative effects associated with alcohol, and not caffeine, when examining AmEDs. • Not generalizable. • Self-reported, retrospective data. • When AmED use in a drinking session may influence the likelihood of adverse consequences, for instance, whether they are used early or later in the evening. • Did not assess whether non-alcoholic ED use may be done prior to alcohol use, which could serve impact alcohol use or high-risk drinking.
Mallett, 2015	<ul style="list-style-type: none"> • Drinking behaviors. • Alcohol use. • AmED use. • Alcohol-related consequences. • Patterns of AmED use. • Effects of AmED use on drinking behaviors and alcohol-related consequences over time. 	<ul style="list-style-type: none"> • 39.6% of students used AmEDs at some point during the study. • 12.4% initiated use during the Fall semester of their sophomore year (T2) 15.6% discontinued use at T2, and 11.6% use continuously. • In the Spring semester of their freshman year (T1) discontinuers drank more and had a higher frequency of drunkenness than initiators - there was an inverse relationship of this at T2. • Continuous users consumed more AmEDs in a typical week at T1 and T2. • Continuous users reported the highest alcohol consumption and alcohol consequences, followed by initiators, then discontinuous, then non-drinkers, at all time points. • From T1 to T2, initiators showed an increase in alcohol consequences and drinking patterns. Discontinuers, increased their drinking patterns as well, but had significantly less alcohol consequences than initiators. 	<ul style="list-style-type: none"> • Not generalizable.

Table 2*Outcomes, Results, & Limitations*

<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Marczinksi, 2011	<ul style="list-style-type: none"> • ED consumption patterns. • Alcohol consumption patterns. • AmED consumption patterns. • AmED motivations. 	<ul style="list-style-type: none"> • Of the entire sample, 44% had tried or were regular consumers of AmEDs. • 70% of those who have tried or are current AmED users also reported binge drinking. • 78% of alcohol users have tried AmEDs or use them regularly. • Most common motivations of regular consumers included, “feel less tired”, “get drunk faster”, “can drink more”, “it is a common drink”, “to hold your liquor better”, “to socialize”, “to get drunk”, “to celebrate”, “to get work done”, and they like the taste. 	<ul style="list-style-type: none"> • Not generalizable. • Cross-sectional design. • List of motivations was not exhaustive and may have been too general for specific interpretation for AmEDs.
Marzell, 2014	<ul style="list-style-type: none"> • AmED Attitudes. • AmED Beliefs. • AmED perceived peer norms. • Heavy drinking. • AmED consumption. • Alcohol-related consequences. 	<ul style="list-style-type: none"> • 27% past 30-day AmED consumption. • AmED users had more positive attitudes and beliefs related to AmEDs than non-users. • AmED users had higher perceived norms of acceptance by their friends. • AmED users had stronger intentions of use in the future than non-users. • AmED users reported higher AmED use, heavy alcohol use, and sexual, academic, and physical consequences than alcohol only users. • AmED attitude measured during the Spring semester of their freshman year (T1) was associated with academic consequences measured during the Fall semester of their sophomore year (T2). • AmED use at T1 is associated with alcohol-related consequences at T2. 	<ul style="list-style-type: none"> • Longitudinal design, but only two data collection points. • Self-reported and retrospective data. • Not generalizable. • Alphas for the version of the YAAPST were low to marginal.
Miller, 2008	<ul style="list-style-type: none"> • ED use. • AmED use. • Jock identity. • Masculine norms. • Risk-taking behavior. 	<ul style="list-style-type: none"> • 26% 30-day AmED consumption, men reported on average twice as many days than women. • Those with higher scores of jock identity, conforming to masculine norms, and risk-taking behaviors were more likely to consume and reported greater frequency of consuming AmEDs in the past 30-days. 	<ul style="list-style-type: none"> • Sample was from one Northeastern public university. • Cross-sectional design. • Self-reported data. • Three scale measures, CMNI Dominance, Masculine Norms, and Risk-Taking Behavior fell short of acceptable reliability (0.7).

Table 2*Outcomes, Results, & Limitations*

<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
O'Brien, 2008	<ul style="list-style-type: none">• AmED use.• Alcohol use.• Alcohol-related consequences.	<ul style="list-style-type: none">• 24% past 30-day AmED use.• Those with higher odds of AmED use were male, white, intramural athletes, fraternity or sorority members, and younger persons.• AmED users had more drinking days during their last year of high school than non-AmED users.• 55% of AmED users did so to hide the flavor or alcohol, 15% to not feel as drunk, 7% to not get a hangover, 5% to not look as drunk and to drink more alcohol, 41% had other reasons such as it was being served at a party, only mixer available, and to make <i>Jagerbombs</i>.• AmED users drank more drinks in a typical session, twice as many heavy episodic drinking days in the past month, twice as many weekly drunkenness episodes, and the greatest number of drinks in a single setting was 36% higher, than non-AmED users.• AmED users had a greater prevalence of being taken advantage of sexually, taking advantage of someone else sexually, riding with a driver under the influence, being hurt or injured, requiring medical treatment, and were more likely to drive drunk at lower amounts of alcoholic drinks than non-AmED users.	<ul style="list-style-type: none">• Cross-sectional design.• Possible selection bias.• Not generalizable.• Self-reported data.
Patrick, 2014	<ul style="list-style-type: none">• AmED use.• Alcohol consequences.• Hazardous alcohol use.• Serious alcohol problems.• Alcohol-related accidents.	<ul style="list-style-type: none">• 26% past 30-day AmED use, 29% of them were frequent users. 30% of heavy episodic drinkers consumed AmEDs infrequently, and 13% used AmEDs frequently.• Infrequent and frequent AmED use was associated with higher reporting of negative consequences and greater odds of hazardous alcohol use.• Frequent AmED use was associated with greater odds of serious alcohol problems and having an alcohol-related accident in the following two years.	<ul style="list-style-type: none">• Sample from one university.• AmED measure does not account for ED and alcohol consumption in separate containers during the same occasion.• Did not collect information on dietary intake or other forms of caffeine consumption.• Not generalizable.

Table 2 <i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Patrick, 2016	<ul style="list-style-type: none"> • AmED consumption. • Activity involvement. • Living situation. • Academic demands. • Drinking motives. • Binge drinking. 	<ul style="list-style-type: none"> • 27% past 30-day AmED use by 2nd year students. • Belonging to a fraternity/sorority, participating in athletics, or residing off-campus had greater odds of using AmEDs. • Inverse relationship between number of early morning classes and odds of using AmEDs. • Honors program students had lower odds of AmED consumption. • Students who held greater fun/social, relax, and image motives for drinking had higher odds of using AmEDs. • Those who held greater physical/behavioral motives not to drink had lower odds of using AmEDs. • Binge drinking was a strong predictor of AmED use in multivariate models. 	<ul style="list-style-type: none"> • Single university sample. • Not generalizable. • Cross-sectional design. • Past 30-day AmED use measurement was dichotomous.
Poulos, 2016	<ul style="list-style-type: none"> • ED consumption. • Side effects of ED consumption. • AmED consumption. • Reasons for AmED consumption. 	<ul style="list-style-type: none"> • 31.9% of past year AmED users consumed AmEDs in the past month. • Men were more likely than women to use AmEDs. • Popular reasons for AmED use included good taste, masking the taste of alcohol, and to provide an energy boost. • Men were more likely to report “partying longer,” “drinking more without looking drunk,” and relaxation as reasons for AmED use. 	<ul style="list-style-type: none"> • Cross-sectional design. • Sample was from a single, large U.S. university. • Not generalizable. • No direct measure for the number of EDs consumed in an entire day. • Low response rate (20.3%).
Reddy, 2014	<ul style="list-style-type: none"> • AmED consumption and prevalence. • ED consumption and prevalence. • Alcohol consumption and prevalence. • Theory of Planned Behavior variables including attitudes, subjective norms, behavioral intentions, and perceived behavioral control associated with AmEDs. 	<ul style="list-style-type: none"> • Theory of Planned Behavior constructs of behavioral intention and attitude were the only significant predictors of AmED use. • Class year was a significant predictor of AmED use, when analyzed by logistic regression. • Behavioral intention was a full mediator for the effect of subjective norms on past 30-day AmED use and is also a partial mediator for the effect of attitudes on past 30-day AmED use. 	<ul style="list-style-type: none"> • Self-reported data. • Cross-sectional design. • Not generalizable.
Snipes, 2013	<ul style="list-style-type: none"> • Drug use. • Alcohol consumption. • AmED consumption. • Sexual behavior. 	<ul style="list-style-type: none"> • 19.4% past month AmED use. • 29.7% of alcohol users used AmEDs in the past month. • AmED users were more likely to use marijuana, ecstasy, and cocaine. • Having unprotected sex, sex after having too much to drink, sex after drug use, and more sexual partners in the past 3 months were associated to AmED use. • AmED use predicted unprotected sex, sex after too much to drink, and sex after drug use, over various factors depending on the relationship. 	<ul style="list-style-type: none"> • Not generalizable. • Self-reported data. • Risk-taking tendencies was not measured, which could explain some associations. • AmED consumption was computed and served as an estimate of AmED consumption which might not be accurate.

Table 2 <i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Snipes, 2014	<ul style="list-style-type: none"> • Drug use. • Alcohol consumption. • AmED consumption. • Sexual victimization. 	<ul style="list-style-type: none"> • AmED consumption was associated with each type of sexual victimization (coerced, threatened, physically forced, incapacitated) for men, but only for physically forced victimization for women. • AmED consumption was associated with male sexual victimization, but not female sexual victimization. 	<ul style="list-style-type: none"> • Preliminary data. • Cross-sectional design. • Small sample of students reported being sexually victimized, which creates a power issue. • Retrospective, self-reported data. • Not generalizable.
Snipes, 2015	<ul style="list-style-type: none"> • Substance use. • Personality traits. • Alcohol consumption. • AmED consumption. • Alcohol dependence patterns. 	<ul style="list-style-type: none"> • 11.6% past-month AmED use. • 9.7% past-week AmED use. • Past-month and past-week AmED users are more likely to report AUDIT scores greater than or equal to 8 (alcohol dependence), ED consumption, lower anxiety, and greater impulsivity when compared to alcohol users who do not use AmEDs. • AmED use predicted patterns of alcohol dependence more so than demographics, drug use, personality factors (e.g., hopelessness, anxiety, impulsivity, and sensation seeking), ED use, and alcohol use. 	<ul style="list-style-type: none"> • Not generalizable. • Self-reported data. • Cross-sectional design.
Stamates, 2017	<ul style="list-style-type: none"> • Alcohol use. • Caffeinated alcohol use. • Trait impulsivity. • Inhibitory control. • Craving. 	<ul style="list-style-type: none"> • Greater subjective craving for alcohol and CABs for those in the simulated bar group than those in the neutral group. • Inhibitory control did not mediate the association between alcohol craving and the respective context. • Impulsivity was positively associated with alcohol and CAB-specific craving. 	<ul style="list-style-type: none"> • Not generalizable. • Baseline performance of impulsivity was not measured. • The neutral context was not outfitted with stimuli like that of the bar (e.g., signs, advertisements, or bottles) that could have influenced the participants • The study did not assess other variables, such as depression or student schedule, that could have influenced the findings. • Definitions and measurements of impulsivity were specific to alcohol-related cues and subjective reports of craving, rather than including other measures for impulsivity.

Table 2*Outcomes, Results, & Limitations*

<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Varvil-Weld, 2013	<ul style="list-style-type: none"> • AmED-specific latent profile indicators. • AmED Expectancies. • AmED attitudes. • AmED normative beliefs. • Longitudinal AmED-related outcomes. • Longitudinal drinking-related outcomes. • AmED use. • Heavy episodic drinking. • Alcohol-related consequences. 	<ul style="list-style-type: none"> • 53.7% of the sample were in the Occasional AmED group. This group had neutral expectancies, attitudes, and injunctive normative beliefs regarding AmED use. Those in this group also believed friends used small numbers of AmEDs each week. • 30.5% of the sample were in the Anti-AmED group. This group had highly negative expectancies, attitudes, and injunctive normative beliefs regarding AmED use. Those in this group also believed friends used small number of AmEDs each week. • 5.2% of the sample were in the Pro-AmED group. This group had the most positive attitudes and injunctive normative beliefs. • 10.6% of the sample were in the Strong Peer Influence group. This group held moderately negative expectancies and attitudes, moderately positive injunctive normative beliefs, and perceived their friends consumed a high number of AmEDs per week. • Pro-AmED and Strong Peer Influence reported higher weekly AmED use than Anti-AmED. • Anti-AmED reported fewer consequences than Pro-AmED. Strong Peer Influence reported fewer consequences than Pro-AmED. • AmED use was associated with AmED profiles, after controlling for heavy and typical weekly drinking. 	<ul style="list-style-type: none"> • Not generalizable. • Two data collection periods, but did not follow students past their second year of college. • Retrospective data. • Self-reported data.
Velazquez, 2012	<ul style="list-style-type: none"> • ED use behaviors. • Alcohol use behaviors. • AmED consumption. 	<ul style="list-style-type: none"> • 14.9% past-month AmED use. • For every one unit increase in past-month ED consumption, the likelihood of consuming AmEDs increased by 90%. • For every one unit increase in past-week ED consumption, the likelihood of consuming AmEDs increased by 140%. 	<ul style="list-style-type: none"> • Low response rate (20.3%). • Cross-sectional design. • Not generalizable. • Self-reported data. • Retrospective data.
Woolsey, 2010a	<ul style="list-style-type: none"> • Alcohol consumption. • AmED consumption. • Risk taking. • Alcohol Consequences. • AmED Consequences. • Brief Comprehensive Effects of Alcohol (B-CEOA) • Brief Comprehensive Effects of Combined Use (B-CEOCU) 	<ul style="list-style-type: none"> • 48% of college athlete drinkers used AmEDs in the past year. • 78.6% of athletes used alcohol. • 48.4% used energy drinks not with alcohol. • Binge drinking occurred in 98.1% and 97.5% of male and female AmED users, respectively. • AmEDs are associated to a significant increase in risk-taking, compared to alcohol-only consumption. • Compared to females, males reported they would enjoy sex more, act more aggressively, be more likely to drive a vehicle, and be more likely to fight when using AmEDs. 	<ul style="list-style-type: none"> • No limitations reported in the article.

Table 2			
<i>Outcomes, Results, & Limitations</i>			
<u>Author & Year</u>	<u>Measured Outcome</u>	<u>Main Results</u>	<u>Limitations</u>
Woolsey, 2010b	<ul style="list-style-type: none"> • Alcohol consumption. • AmED consumption. • Risk taking. • B-CEOA • Comprehensive Effects of Combined-use • Alcohol consequences. • AmED consequences. 	<ul style="list-style-type: none"> • 37.4% past-year AmED use. • AmED users consumed more alcohol, had riskier drinking habits, greater overall risk-taking, and greater consequences than those who used alcohol but not AmEDs. • AmED users drank more alcohol per occasion, binge drank more often, drank more often, drank more alcohol on one occasion, and used more than double the amount of alcohol the previous year, than alcohol users who did not use AmEDs. 	<ul style="list-style-type: none"> • No limitations reported in the article.
Woolsey, 2015	<ul style="list-style-type: none"> • Alcohol consumption. • AmED consumption. • High-risk driving. • High-risk drinking. 	<ul style="list-style-type: none"> • 48.8% past-year AmED use by alcohol users. • AmED users were more likely than alcohol user who do not use AmEDs to report driving even though they knew they had too much alcohol, thinking they were driving over the legal limit, and riding with a driver they knew had too much alcohol to drive safely. • AmED users had greater rates of high-risk drinking behaviors for all measures 	<ul style="list-style-type: none"> • Not generalizable. • Cross-sectional data. • Self-reported data. • Could not assess the number of EDs when participants drove impaired or after they knew they had drank too much alcohol.

Chapter 3

ENERGY DRINK EXPECTANCIES AMONG COLLEGE STUDENTS

The initial section of this chapter includes an abstract and overview of the impact energy drinks have on college students and associated problems. The second section details the methods used to complete this study. The third section contains the results in the conclusion. The chapter concludes with a summary paragraph, references, and tables and figures. The purpose of this article is three-fold: 1) to examine the energy drink expectancies of college students, 2) determine how much variance the expectancies account for in predicting energy drink consumption, and 3) to assess which of the expectancies is most predictive of energy drink consumption. A cross-sectional study design was implemented to examine the energy drink expectancies of college students, the variance the expectancies account for, and the relationships among demographics, substance use, and energy drink consumption with the expectancies. A copy of the Journal of American College Health publication guidelines can be found in Appendix B.

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Abstract

Objective: Since the late '90s, energy drink consumption has increased. The purpose of this investigation is to examine the energy drink expectancies of college students.

Participants: The university registrar randomly selected fifty university classes to

complete the questionnaire. **Methods:** A cross-sectional research design was utilized to

assess the prevalence of energy drink consumption and energy drink expectancies. Binary logistic regression analyses were conducted to ascertain which expectancies predicted

energy drink consumption. **Results:** The expectancy factors of 1,246 participants accounted for 24.3% of the variance in past 30-day energy drink consumption.

Anxiety/Negative Physical Effects, Withdrawal, Energy Enhancement, and Social/Mood Enhancement were found to be significantly related to energy drink consumption.

Conclusions: Anxiety/Negative Effects and Energy Enhancement were the strongest predictors of energy drink consumption among college students. The results from this study can be used to design interventions to challenge erroneous expectancies and reinforce expectancies, which promote moderation or abstinence.

Introduction

Since their introduction to the United States in 1997, energy drinks have gained popularity. This is evidenced by the almost two-thirds growth in sales from 2008 to 2012, and the estimated U.S. sales of energy drinks reaching \$32 billion by 2025.^{1,2} Additionally, the consumption rates of energy drinks are increasing, which is especially true with regard to college students, where 82% of college students reported consuming an energy drink at least once in their lifetime and about a third (36.4%) consumed energy drinks in the past two weeks.³ Further, past 30-day consumption rates range from 22% to 70%,^{4,5} while weekly usage rates vary from 13% to 59%.⁵⁻⁸ The consumption rates may differ due to the characteristics of the sample population, where and when the study was conducted, and potentially the methods used to collect the data.

The consumption rates of energy drinks have been associated with poor academic outcomes, including an inverse relationship between 30-day energy drink consumption and grade point average.⁵ Researchers speculate poor academic performance could be due to sleep deprivation associated with consuming energy drinks when preparing for last minute deadlines or tests.⁵ According to the results from the Pittsburg Sleep Quality Index, energy drink consumption accounts for 20% of the variance in sleep disturbance and is linked with poorer sleep quality, taking longer to fall asleep, and shorter sleep duration.⁹ Furthermore, an association exists between grade orientation and the inability to stop consuming energy drinks, as well as a relationship between high-grade orientation and academic dishonesty, such as cheating on an academic assignment (e.g., plagiarism).¹⁰⁻¹¹ Marsden and colleagues¹¹ suggest that students who score high on grade orientation are more likely to look for alternative studying methods. Ianni & Lafrenier¹⁰

further speculate consuming energy drinks could be a shortcut used to gain a better grade by staying up late to study before an exam. Additionally, they eventually become accustomed to this behavior, which influences their ability to stop because they fear their grades will suffer.

Other associated behaviors with consuming energy drinks can be detrimental to the user's health and lead to poor outcomes. These behaviors include disordered eating, weight loss attempts, illicit prescription drug use, drunk driving, riding with a drunk driver, and excessive alcohol use.¹²⁻¹⁴ Moreover, high frequency energy drink use is linked to heavier alcohol consumption, with related consequences of blacking out, hangovers, drinking to cope, enhancement motives for drinking alcohol, and meeting the criteria for alcohol dependence.^{6,15} One of the more serious concerns with energy drink consumption is the rise in emergency department visits, which doubled in a three-year span from 10,000 in 2007 to 20,000 in 2011.¹⁶ Indeed, 1 in 10 of these visits resulted in hospitalization due to adverse reactions such as tachycardia, irregular heartbeat, high-blood pressure, high-blood sugar, insomnia, headache, nervousness, and seizures.¹⁷ Additionally, higher perceived stress levels are related to increased 30-day energy drink consumption.⁵ Furthermore, anxiety has been linked to energy drink consumption in college students. The frequency of energy drink use accounted for 29% of the variance in anxiety scores, among a small sample of college students.⁹ With regard to AmED use, depression symptoms were positively associated with consumption patterns.¹⁸

In considering peoples' motive(s) when making decisions pertaining to their health choices, outcome expectancies are particularly useful in explaining and predicting behavior. Expectancies are a construct of the Social Cognitive Theory and are similar to

expectations¹⁹. Expectations are the assumed outcome of a behavior, while expectancies are the positive or negative value a person places on the expectations of an outcome. Expectancies are learned through experience, observation, or suggestion and in turn will influence whether the person performs the behavior of interest.¹⁹⁻²⁰ Researchers have utilized expectancies to examine the following topics: illicit drug use, alcohol, alcohol mixed with energy drinks, and caffeine.²⁰⁻²³

More relevant to the current study Heinz and colleagues²⁴ developed a Caffeine Expectancy Questionnaire (CEQ) and identified four factors: withdrawal symptoms, positive effects, acute negative effects, and mood effects. The CEQ was revised three years later and seven factors were categorized: Withdrawal/dependence, energy/work enhancement, appetite suppression, social/mood enhancement, physical performance enhancement, anxiety/negative physical effects, and sleep disturbance.²⁰ While expectancies for caffeine are well documented, little is known about college students' motivation for consuming energy drinks, which include other stimulants besides caffeine. To address this gap in the literature, energy drink expectancies of college students were assessed. The purpose of this study was three-fold: 1) to examine the energy drink expectancies of college students, 2) determine how much variance the expectancies account for in predicting energy drink consumption, and 3) to assess which of the expectancies is most predictive of energy drink consumption.

Methods

Participants

Participants included students from a large public university in the Midwest. After receiving IRB approval, participants were recruited through simple random sampling.

The campus registrar provided the researchers with a list of fifty randomly selected undergraduate courses for the fall 2017 semester. The inclusion criteria consisted of undergraduate students, between 18 and 25 years old, who were in attendance the day the survey was distributed in class. Researchers were granted access to 29 of the 50 randomly identified courses (58%), with four instructors inviting researchers into additional course sections or into a main lecture of the same course for additional participant inclusion. Nine students (0.7%) opted out of taking the questionnaire, for a total of 1,246 participants. While cleaning the data, seven of the participants were removed as they did not meet the age requirements for the study, thus the final number of participants was 1,239. A sample size analysis was conducted using a margin of error of 5% and a confidence level of 95%, necessitating a minimum sample size of 377.²⁵ Additionally, recommendations for factor analyses suggest 5-10 participants per item; concluding a study population total of 380 for the 38-item expectancy matrix.²⁶ Over-sampling was conducted to ensure adequate power to analyze the data by smaller demographic groups.

Research Design and Procedures

Researchers utilized a cross-sectional research design to collect self-reported, quantitative data on behaviors and perceptions of energy drinks. Participants were given a standardized alcohol and drug survey²⁷ which included customized items concerning energy drink expectancies. Energy drink consumption was measured by lifetime, 30-day, and past week consumption, as well as the number typically consumed, the number consumed they last time they had an energy drink, and the most consumed in one sitting. For this investigation, the dependent variable was energy drink consumption, and the

independent variables were demographics, alcohol use, grade point average, and energy drink expectancies.

Questionnaires were disseminated to college students in 32 randomly selected classrooms, where participants were given a manila envelope with the questionnaire inside. Following the completion of the questionnaire, participants placed the questionnaire back in the envelope and placed it into a box at the front of the room. The data from the questionnaires were entered into IBM SPSS Statistics Version 24 by the lead researcher.

Instrument

A comprehensive literature review of energy drinks was conducted to establish face validity of the questionnaire (energy drink expectancies). To help design the survey, focus groups were conducted to cross-reference findings from the literature review concerning the items that pertain to energy drink expectancies. Test-retest and Cronbach's alpha were analyzed to assess the reliability of the instrument. In addition, to enhance content validity the survey was critiqued by a variety of experts including a college health promotion specialist, a social epidemiologist, an alcohol and drug researcher, and a psychometric expert. The questionnaire consisted of 74 items, and assessed college student substance use, energy drink use, energy drink expectancies.

Measures

Demographics. The participants were college students, aged 18 to 25. Other demographic measurements included year of college they are in, gender, race, living arrangement, employment status, and grade point average (GPA).

Alcohol Measures. Number of drinks consumed the last time they “partied,” past two-week binge drinking, average number of drinks consumed in a week, largest number of drinks consumed on one occasion, and past 30-day alcohol use. The following definition for an alcoholic drink was provided, “*An alcoholic drink is defined as being 12-ounces of beer (5% alcohol content), 8-ounces of malt liquor (7% alcohol content), 5-ounces of wine (12% alcohol content), or 1.5-ounces, or a shot, of 80-proof (40% alcohol content) distilled spirits or liquor.*”

Energy Drink Expectancies. Energy drink expectancies included a 38-item matrix, utilizing a uni-polar agreeability scale, where the participants indicated how much they agree with the statement if they were to have an energy drink; regardless of their prior use. Within the 38-items are seven a priori categories of expectancies: Withdrawal, Social/Mood Enhancement, Energy Enhancement, Physical Performance Enhancement, Anxiety/Negative Physical Effects, Appetite Suppression, and Alcohol and Partying. Each category contained four to nine items.

To determine the temporal stability of the instrument a test/retest analysis was conducted two weeks apart with 27 students. The percent agreement values among the expectancy factors were at least 81.5%, which indicates adequate reliability. More specifically, the values are listed as follows: Physical Performance Enhancement, 100%; Alcohol/Partying, 88.9%; Withdrawal, 88.9%; Energy Enhancement, 85.2%; Social/Mood Enhancement, 85.2%; Negative/Physical Effects, 85.2%, and Appetite Suppression, 81.5%.

Energy Drinks. Energy drink frequency of use, AmED frequency of use, speed of energy drink consumption, and reasons why students used energy drinks were assessed.

Data Analysis

To describe the sample population descriptive statistics were calculated, which included frequencies, percentages, means, and standard deviations. A principal components analysis was conducted to categorize the energy drink expectancies. Pearson correlations were conducted to assess the relationships among the energy drink expectancies. A multinomial logistic regression was used to determine how much of the variance the model accounted for and binary logistic regressions were used to determine which of the expectancies held the strongest relationship to energy drink consumption among college students. The expectancies were coded to reflect whether the answer was positive or negative for the binary logistic regression; neutral responses were omitted.

Results

Demographics. Almost two-thirds of the sample were female (63.7%). Participants indicated their age by identifying what year they were born, which resulted in a mean birth year of 1997.16 ($SD= 1.71$), or an average age of around 20 years old. Students were classified by their current year in school (e.g. 43.7% first year, 14.1% second year, 15.5% third year, 20.4% fourth year, and 6.3% 5th year or more). Most of the sample was Caucasian (79.6%) and non-Hispanic (93.9%). Two-thirds of the students lived off-campus (65.3%), over half were employed with either part-time or fulltime work (57.7%), and over 90% reported a grade point average of a B (2.70 – 3.66) or higher (93.5%). The sample was similar to the overall student population of the institution with

regard to race, Hispanic origin, and age; however, females were slightly overrepresented. See Table 1 for demographics.

[Insert Table 1]

Energy Drink and AmED Use. Approximately 32% of the sample consumed energy drinks in the past 30 days, with 18% using in the past-week. Roughly 10% of the sample used AmEDs in the past 30 days, with 3.7% using AmEDs in the past week.

Speed of Consumption. The time it typically took participants to consume an energy drink (not an energy shot) varied, with 13.3% of the sample taking less than 10 minutes, 35.8 took 11 to 20 minutes, 26.2% took 21 to 30 minutes, and nearly a quarter (24.7%) of the sample took over a half hour to finish their drink.

Reasons for ED use. Participants indicated the following reasons for consuming energy drinks: wake up, 57.4%; study, 37.7%; taste, 34.3%; concentrate, 19.6%; pay attention in class, 18.2%; thirsty, 18.1%; party, 12.2%; exercise harder, 7.4%; exercise longer, 7.3%; habit, 5.2%; and addicted, 2.8%.

Principal Components Analysis. A principal components factor analysis was conducted using an orthogonal (varimax) rotation with Kaiser normalization (IBM SPSS Statistics Version 24). A combination of approaches was used to determine the number of factors. Based on previous research and the description of the questionnaire, it was hypothesized the items would be categorized into eight factors; however, the eigenvalues produced from the factor analysis was indicative of six factors. After further examining the alignment of the eigenvalues in the respective factors, the items were aligned into seven factors; resulting in factors that were more organized and theoretically-sound, compared to the original classification. The items were associated to the factors as long as they met

the following criteria: (a) their eigenvalues were $> .40$; (b) the items made theoretical sense to be included in the respective factor; and (c) the item's eigenvalues were highest in that particular factor.

The Bartlett's test of sphericity run in accordance with the principal components analysis was significant, $\chi^2 = 37070.43$, $df = 703$, $p < .000$. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .966, indicating the sample was adequate for performing a factor analysis. The expectancies, from the 38-item, seven-factor, energy drink expectancy questionnaire explained 72.5% of the total variance in the original variables. The seven factors were labeled as follows: Withdrawal, Energy Enhancement, Appetite Suppression, Social/Mood Enhancement, Physical Performance Enhancement, Anxiety/Negative Physical Effects (which included sleep disturbance expectancy statements), and Alcohol and Partying. Factor loadings and communalities for each item are shown in Table 1.

[Insert Table 2]

Correlations. Table 2 illustrates the correlation values computed among each of the expectancy factors. The inter-correlation matrix shows statistically significant relationships between each of the expectancy factors, ranging from .414 to .727. All relationships were significant at the $p < .01$ significance level. Four relationships reflected poor reliability (Anxiety/Negative Physical Effects to Physical Performance Enhancement, .414; Anxiety/Negative Physical Effects to Social/Mood Enhancement, .458; Anxiety/Negative Physical Effects to Withdrawal, .457; and Alcohol and Partying to Anxiety/Negative Physical Effects, .431). The remaining 17 correlations indicated moderate relationships between the variables ranging from .505 to .727.²⁸ Overall, the

correlation values indicate statistically significant relationships between the expectancy factors; however, they were not highly correlated. The results indicate the expectancy factors were independent from one another, therefore limiting concerns of multicollinearity.

[Insert Table 3]

Variance. A multinomial logistic regression was conducted to determine the variance accounted for by the expectancy factors collectively, based on the full scale of each factor, on past 30-day energy drink consumption. Regression results revealed the model explained 24.3% (Nagelkerke pseudo R^2) of the variance in past 30-day energy drink consumption, with a -2 Log Likelihood of 1034.236. The model correctly classified 69.0% of the cases.

Odds Ratios. Binary logistic regressions were run, individually, on the positive and negative energy drink expectancies and past 30-day energy drink consumption. The results from the logistic regressions ($n=790-845$) reveal the Nagelkerke pseudo R^2 value ranged from .011 to .065, among the analyses and was statistically significant at the 0.01 level. Past 30-day energy drink consumption was significantly associated with four positive and negative energy drink expectancies. The odds ratio results, depicted in Table 3, shows Anxiety/Negative Physical Effects to be the strongest predictor of energy drink consumption. Binary logistic regression analyses revealed the students who disagreed (held negative expectancies) with the Anxiety/Negative Physical Effects expectancy statements were 2.5 times as likely to consume energy drinks in the past 30 days, compared to students with positive expectancy scores. Further, students who disagreed (held negative expectancies) with the Withdrawal expectancy statements were 1.6 times

as likely to consume energy drinks in the past 30 days, compared to those with positive expectancy scores. Additionally, students who agreed (held positive expectancies) with the Energy Enhancement expectancy statements were 2.2 times as likely to consume energy drinks in the past 30 days, compared to students with negative expectancy scores. Finally, students who agreed (held positive expectancies) with the Social/Mood Enhancement expectancy statements were 1.5 times as likely to consume energy drinks in the past 30 days, compared to those with negative expectancy scores.

[Insert Table 4]

Comment

Energy drinks debuted on the U.S. market in the late '90s. Since their introduction, they have gained popularity, evidenced by their growth in sales and increased use among various populations, especially college students. Consuming energy drinks has been associated with poor academic outcomes and serious health consequences that include emergency room visits and hospitalization.^{5,9,12,16-17} The purpose of this study was to examine college students' motivations for consuming energy drinks and, further, which of these expectancies is strongest in influencing consumption. This study is novel, as it is the first one to date, to explore the positive and negative energy drink expectancies among a sample of U.S. college students.

Consistent with previous research, approximately 30% of the sample consumed energy drinks, while roughly 10% used AmEDs in the past 30-days.^{8,29-31} Most participants indicated that it took them 11 to 30 minutes to drink an energy drink on average. Further, similar to the results from other studies, students reported they

consumed energy drinks to wake up, study, taste, concentrate, and pay attention in class.^{29,32-34}

A principal components analysis yielded seven factors, which include: Withdrawal, Energy Enhancement, Appetite Suppression, Social/Mood Enhancement, Physical Performance Enhancement, Anxiety/Negative Physical Effects, and Alcohol and Partying. These factors explained a quarter of the variance in past 30-day energy drink consumption, which is typical of expectancy research.^{21,36-39}

The results from the binary logistic regression analyses, comparing positive and negative expectancy scores, revealed four factors predicted energy drink consumption. Most notably the strongest expectancy was the Anxiety/Negative Physical Effects factor, where students who thought the negative outcomes associated with the expectancy statements would not occur were 2.5 times as likely to consume energy drinks in the past 30 days than their counterparts who thought the outcomes would occur. This finding is similar to previous research with regard to caffeine expectancies, where greater anxiety/negative physical effects and sleep disturbances were negatively associated with frequency and quantity of caffeine consumption.²⁰ Additionally, students who did not think the outcomes related to the Withdrawal expectancy statements would affect them were approximately 1.5 times as likely to consume energy drinks, compared to those thought they may experience withdrawal symptoms. One possible explanation for this is users consume energy drinks to prevent withdraw symptoms, whereas abstainers were not concerned with such issues. Moreover, users do not believe that these negative outcomes associated with the expectancy factors of Anxiety/Negative Physical Effects nor Withdrawal will occur.

Conversely, students who thought consuming energy drinks would result in increased energy (Energy Enhancement Expectancy) were twice as likely to consume energy drinks as those with negative expectancy scores. Indeed, research indicates 32% to 65% of users consume energy drinks because of “needing more energy in general.”^{34,40} Moreover, researchers found people often consume energy drinks while studying or working in an attempt to increase their performance.^{29,32-34} Ironically, while users identify studying as a common reason for using energy drinks, research shows a negative relationship between past month energy drink consumption and GPA.⁴¹ The assumption that energy drinks help people to study or work is undoubtedly influenced by the aggressive marketing strategies employed by the energy drink industry.⁴²⁻⁴⁴ With slogans or taglines suggesting hours of energy with no crash or that the beverage will “give you wings” or “fuel your brain,” it is not surprising that people have such strong expectancies concerning energy enhancement.

Finally, students who believed energy drink use would enhance their mood or make them feel more social (Social/Mood Enhancement Expectancy) were 1.5 times as likely to consume energy drinks compared to those who assumed no such benefit. Past research shows “feeling more happy” is a common effect reported by those who regularly consume energy drinks.³² Additionally, “being more involved with a circle of friends” or general social motives, was a frequent response cited for using energy drinks.^{29,32} Conceptually, these expectancies are theoretically sound, those who expect a negative effect to occur when they perform a behavior, in this case consume energy drinks, are less likely to perform the behavior or vice-versa.^{19,45}

Implications for Prevention

The results of this study can be used to design interventions to curb energy drink consumption. More specifically, college students need accurate information on the facts and myths concerning energy drinks. For example, when educators discuss student success during freshmen orientation they can share that energy drinks are not associated with increased grades and instead emphasize empirically based study strategies. Further, a health communication campaign could be created and disseminated throughout campus, highlighting the health hazards associated with energy drinks and AmEDs, as well as harm reduction strategies to safely use the products. Policy changes such as not selling energy drinks on campus or in limited locations can be implemented to improve overall student wellness. Finally, due to the prevalence of use and associated consequences, energy drink misuse should be an objective of *Healthy Campus 2030*⁴⁶.

Limitations

The findings from this study are not without limitations and should be interpreted with caution. First, the research design for this investigation was cross-sectional; therefore, causal inferences cannot be made. The sample population for this study was limited to college students, at a mid-sized public university in the Midwest; consequently, the results may not be generalizable to other institutions of higher education. Self-reported data were collected for this study, thus due to the sensitive nature of some of the questions in the survey, participants may have underreported or over-reported their use, while others may have been unable to accurately recall their use. Due to behaviors being illegal or viewed negatively, students may have provided socially desirable answers. Further, selection bias represents another concern, only those who were present in class the day the survey was administered took the survey. Further, because most students do

not consume energy drinks the data were skewed and could not be normalized through logarithmic functions. Internal validity represents another issue, because participants may not have recognized what constitutes an “energy drink” even though a definition for an energy drink was provided within the instrument. Further, due to a lack of consistent guidelines for what an energy drink is, students may be consuming these beverages and not be aware. Finally, the questionnaire was lengthy, at 74-items, therefore survey fatigue may have compromised the accuracy of the students’ responses.

Conclusions

The energy drink expectancies of undergraduate college students and how those expectancies explained energy drink consumption were examined in this study. The data determined that energy drink expectancies accounted for nearly 25% of the variance in past 30-day energy drink use. Descending from the strongest to weakest predictor, Anxiety/Negative Physical Effects, Energy Enhancement, Withdrawal, and Social/Mood Enhancement explained energy drink consumption. Odds ratios among these factors ranged from 2.5 times as likely to 1.5 times as likely to consume energy drinks in the past 30-days. It is important to note that both positive and negative expectancies predicted energy drink consumption, thus interventions should address each classification of expectancy.

While the findings from this study provide useful information concerning energy drinks more research is warranted. Researchers should utilize qualitative designs to explore energy drink expectancies, to gain a better understanding of why certain expectancies exist, as well as to examine why college students use energy drinks. Specific times of the semester should also be of focus for energy drink research, most

notably during mid-terms or finals week. Additionally, longitudinal research centered on the changes of energy drink consumption and energy drink expectancies, over the course of a students' college career should be explored. Further, intervention research with an experimental design needs to be conducted to evaluate prevention efforts aimed at decreasing energy drink consumption. This could include health communication, social marketing, or health education campaigns. Going forward, it is important to continue to research energy drinks and their precarious outcomes. By further directing research and advocacy efforts towards these topics, researchers can answer questions that will directly help to curb use, consequences, and associated behaviors, all the while improving the wellness and academic outcomes of college students.

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Tables

Table 1		
<i>Demographics, Energy Drink, and AmED Use</i>		
	<u>Study Sample Rates</u>	<u>Institution Rates</u>
<u>Current Year in School</u>		
1 st	43.7% (541)	Fresh: 24.7%
2 nd	14.1% (175)	Sophomore: 22.9%
3 rd	15.5% (192)	Junior: 18.5%
4 th	20.4% (252)	Senior: 33.9%
5 th or more	6.3% (78)	
<u>Year of Birth</u>		
91	0.4% (5)	n/a
92	0.6% (7)	n/a
93	2.3% (28)	n/a
94	3.9% (48)	n/a
95	10.3% (127)	n/a
96	17.5% (216)	n/a
97	12.4% (153)	n/a
98	24.7% (305)	n/a
99	27.9% (344)	n/a
<u>Race</u>		
American Indian/Alaskan Native	0.5% (6)	0.2%
Asian	2.6% (32)	2.1%
Native Hawaiian/Pacific Islander	0.0% (0)	0.06%
White	79.6% (986)	68.8%
Black	8.4% (104)	11.4%
Multiracial	5.8% (72)	2.9%
Other	3.1% (38)	n/a
<u>Hispanic Origin</u>		
Yes	6.1% (75)	5.0%
No	93.9% (1,162)	95.0%
<u>Gender</u>		
Male	35.8% (444)	51.6% (2015-16)
Female	63.7% (788)	48.4% (2015-16)
Transgender	0.1% (1)	n/a
Other	0.4% (5)	n/a
<u>Living Situation</u>		
On-Campus	34.7% (430)	n/a
Off-Campus	65.3% (808)	n/a
<u>Employment</u>		
Full-Time	3.3% (41)	n/a
Part-Time	54.4% (672)	n/a
Unemployed	42.3% (522)	n/a
<u>GPA</u>		
A (3.67 – 4.0)	43.4% (526)	n/a
B (2.70 – 3.66)	50.1% (607)	n/a
C (1.70 – 2.69)	6.2% (75)	n/a
D (0.70 – 1.69)	0.2% (3)	n/a
F (0.00 – 0.69)	0.1% (1)	n/a
<u>Energy Drink Use</u>		
Past 30-days	32.3	n/a
Past Week	18.0	n/a
<u>AmED Use</u>		
Past 30-days	10.3	n/a
Past Week	3.7	n/a

Table 2

7-Factor Exploratory Factor Analysis: Factor Loadings and Communalities

<u>Expectancy Factors and Statements</u>	<u>Factor Loadings</u>	<u>Communalities</u>
<u>Withdrawal Expectancy</u>		
I need to have an energy drink every day	.817	.793
I would have difficulty starting my day without an energy drink	.776	.793
I would get a headache if I went without having an energy drink	.767	.796
I often crave energy drinks	.754	.759
I would experience withdrawal if I went without an energy drink	.713	.668
<u>Energy Enhancement Expectancy</u>		
I feel less sleepy after having an energy drink	.706	.729
Energy drinks make me feel more energetic	.701	.758
Energy drinks make me feel more alert	.687	.692
Energy drinks help me to work over long periods of time	.507	.681
Energy drinks increase my motivation to study	.475	.626
<u>Appetite Suppression Expectancy</u>		
Energy drinks suppress feelings of hunger	.772	.768
Energy drinks decrease my appetite	.766	.790
Energy drinks allow me to skip meals	.699	.788
Energy drinks help me avoid eating more than I should	.663	.788
Energy drinks help me control my weight	.427	.655
<u>Social/Mood Enhancement Expectancy</u>		
Having an energy drink makes me friendlier	.695	.738
I feel more sociable after having an energy drink	.612	.792
Conversations are better when I have an energy drink	.575	.743
I feel more confident after having an energy drink	.527	.769
Energy drinks improve my mood	.485	.727
<u>Physical Performance Enhancement Expectancy</u>		
I can exercise harder if I have an energy drink	.787	.874
I can exercise longer if I have an energy drink	.780	.840
Energy drinks make my workouts better	.771	.763
Energy drinks improve my athletic performance	.719	.797
<u>Anxiety/Negative Effects Expectancy</u>		
Even a small amount of an energy drink makes me anxious	.796	.741
I don't like the way energy drinks make me feel	.766	.602
I am easily stressed after having an energy drink	.748	.680
Having an energy drink makes me feel nervous	.747	.649
An energy drink at any time of day throws off my sleep	.715	.654
I have difficulty sleeping after having an energy drink	.672	.789
Energy drinks make me jittery	.651	.622
An energy drink late in the day gives me insomnia	.620	.723
Having an energy drink late in the day disrupts my sleep	.585	.726
<u>Alcohol & Partying Expectancy</u>		
Energy drinks allow me to drink more alcohol	.785	.774
Energy drinks mixed with alcohol taste better	.717	.623
Energy drinks help me to party longer	.671	.724
Energy drinks help me to recover from a hangover	.617	.643
Energy drinks make me feel less drunk	.482	.500

Table 3							
<i>Expectancy Factor Correlation Matrix</i>							
	1	2	3	4	5	6	7
1. Withdrawal Expectancy	--						
2. Energy Enhancement Expectancy	.631**	--					
3. Appetite Suppression Expectancy	.612**	.635**	--				
4. Social/Mood Enhancement Expectancy	.687**	.727**	.704**	--			
5. Physical Performance Enhancement Expectancy	.580**	.662**	.609**	.719**	--		
6. Anxiety/Negative Physical Effects Expectancy	.457**	.530**	.505**	.458**	.414**	--	
7. Alcohol and Partying Expectancy	.575**	.648**	.659**	.714**	.656**	.431**	--
** = $p < .01$.							

Table 4			
<i>Logistic Regression: Positive and Negative Energy Drink Expectancies and 30-day ED Use</i>			
<u>Expectancy Factors</u>	<u>Odds Ratio</u>	<u>CI</u>	<u>p-Value</u>
Anxiety/Negative Physical Effects Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.50	1.89 – 3.34	<0.001
Withdrawal Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	1.62	1.14 – 2.30	0.007
Physical Performance Enhancement Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	1.20	0.86 – 1.60	.315
Energy Enhancement Expectancy			
Agree (Positive)	2.20	1.60 – 2.90	<0.001
Disagree (Negative)	REF	-	
Social/Mood Enhancement Expectancy			
Agree (Positive)	1.50	1.10 – 2.06	0.012
Disagree (Negative)	REF		
Appetite Expectancy			
Agree (Positive)	1.40	0.97 – 1.98	0.075
Disagree (Negative)	REF	-	
Alcohol and Partying Expectancy			
Agree (Positive)	1.25	0.88 – 1.76	0.203
Disagree (Negative)	REF	-	

Chapter 4

Conclusions

This chapter provides an overview and further background for the results of the current studies. The contents of the chapter are divided into the following sections:

Summary of the Study, Failed to Reject Hypotheses, Rejected Hypotheses, Discussion, Recommendations, Synthesis of Articles, Future Research, and Summary.

Summary of the Studies

Article 1

While not an alcoholic beverage, nor an illicit drug, energy drink consumption is a form of substance use and abuse. This field of study is in its infancy. Energy drinks are caffeinated beverages, which may contain herbal supplements and amino acids. Energy drinks may also be carbonated. These beverages are designed to stimulate the body mentally and physically and include products such as Red Bull®, Monster®, Rock Star®, Amp®, 5-hr Energy®, and other similar beverages. This definition does not pertain to beverages such as coffee, tea, or soda pop (Energy Drink, 2016).

Energy drinks debuted in the United States in 1997, with consumption and popularity of the beverages increasing in recent years. The growth of energy drinks and their consumption is evidenced by the wide variety (300+) of energy drinks available and the areas a consumer can purchase an energy drink, from gas stations and grocery stores to campus vending machines (Heckman, Sherry, & Gonzalez De Mejia, 2010). The growth in energy drinks is also evidenced by consumption patterns of college students, where past 30-day consumption rates range from 22% to 70% (Gallucci, Martin, Hackman, & Hutcheson, 2016; Pettit & DeBarr, 2011). Further, 82% of college students

reported consuming an energy drink at least once in their lifetime and about a third (36.4%) had consumed energy drinks in the past two weeks (Marczinski, 2011).

This sale of this product is not without safety concerns, especially when it was sold pre-mixed with alcohol (e.g., Four Loko®). The safety concerns were significant enough that the U.S. Food and Drug Administration (FDA) effectively banned the manufacturing and sale of alcoholic energy drinks in 2010 (FDA, 2010). While this is a step in the right direction, mixing energy drinks with alcohol (e.g., RedBull® and vodka and *Jagerbombs* [Jagermeister and RedBull®]) remains a common practice among young adults. Just under 30% of college students reported consuming energy drinks during the past month and two-thirds indicated drinking them within the last year (Berger, Fendrich, Fuhrmann & 2013; Patrick, Macuada, & Maggs, 2016). Energy drinks by themselves accounted for roughly 12,000 emergency department visits in 2011, with another 2,600 caused by their combination with alcohol (SAMSHA, 2013). Further, 8% of the emergency department visits for energy drinks mixed with alcohol or other drugs resulted in hospitalization of the patient (SAMSHA, 2014).

Additionally, AmEDs have been linked to increased risky behaviors and consequences of their use, including increased risk of dependence tendencies. Of those who have tried or regularly consumed AmEDs, 60% report binge drinking, compared to 28% of non-AmED consumers who binge drink (Marczinski, 2011). This accentuates previous findings, where researchers found that over half of energy drink users do so to drink with alcohol while partying (Malinauskas et al., 2007). Past year hazardous drinkers, those who participate in a drinking pattern that puts themselves at risk for alcohol-related harm, were more likely to drive under the influence after consuming

AmEDs than other hazardous drinkers that did not consume AmEDs (Berger et al., 2013). AmED users reported driving while under the influence at more than twice the rate of non-AmED users (Woolsey et al., 2015). Additionally, in past month and past week analyses indicate those who consumed AmEDs had higher rates of drug use, including marijuana, ecstasy, and ketamine, compared to alcohol only users and non-drinkers (Snipes et al., 2015).

While numerous studies on energy drinks and college students exist, the literature has not been critically reviewed. The purpose of this study was to synthesize the research on college students and AmEDs and to identify potential gaps in the literature. More specifically, the topics published on this topic were assessed as well as the level of scientific rigor used to conduct the research on AmEDs, including study design, location, target population, validity and reliability, outcomes, and limitations.

The following research questions were investigated:

1. What is the prevalence of alcohol mixed with energy drink consumption among college students and does it differ by demographics (gender, age, race, athletics, field of study, year in school, enrollment status, and fraternity or sorority membership)?
2. What is the association between alcohol mixed with energy drink consumption and health (alcohol, illicit drug use, nutrition, sleep, mental health, and sexual consequences)?
3. What is the association between alcohol mixed with energy drink consumption and academics (GPA, class attendance, turning assignments in on time, and tardiness).

4. Based on traditional research standards (sample selection and size, response rate, survey administration, validity [internal & external] and reliability) what level of scientific rigor did the researchers employ when publishing their studies?
5. What gaps exist in the literature concerning college students and alcohol mixed with energy drink consumption?

The search for this literature review included determining the inclusion/exclusion criteria, identifying keywords, and utilizing specific databases. Databases searched included Academic Search Complete, ERIC, Medline, OhioLINK, ProQuest Dissertations, PsychInfo, PubMed, Web of Science, and Google Scholar. The following key terms were used in the search: Search 1: Energy drinks OR energy drink OR energy beverages OR energy beverage OR caffeine OR caffeinated. Search 2: College OR college student OR college students OR university OR university student OR university students OR universities. Search 3: Alcohol OR alcoholic. Search 4: Caffeinated Alcohol Beverage OR CAB OR AMED OR Alcohol mixed with energy drink OR alcohol mixed with energy drinks. Search 5: Search 1 AND Search 2. Search 6: Search 1 AND Search 2 AND Search 3. Search 7: Search 1 AND Search 2 AND Search 4. Search 8: Search 1 AND Search 2 AND Search 3 AND Search 4. In addition, the reference list of each article was reviewed to determine if other studies should be included in the review.

The articles included in the review were limited to studies conducted in the United States, with study populations of college students between 18 and 25 years old. In addition, articles published prior to 2006 were not included unless they were deemed seminal studies. This is due to the lack of research on the topic prior to 2006.

International studies were excluded from this analysis because the laws and restrictions on energy drinks in other countries may differ significantly from the United States, which could influence consumption rates and perceptions.

Of the 164 articles identified in the literature search, 60 were excluded by title review, as they either did not focus on AmEDs, college students, or were not relevant to the purpose of the study. Following the abstract review, 61 articles were excluded because they did not include US college undergraduate students between 18 and 25 or were not relevant. Forty-three full-text articles were reviewed, with eight being excluded because non-college students were sampled or the topic was not relevant to the current inquiry. The first studies on this topic were published in 2007, thus no articles included in this review pre-dated that time. The final number of articles included for systematic analysis was 35.

Twenty-one of the 35 studies included AmED use or use patterns with another seven that measured CAB use, 24 measured alcohol use or alcohol use patterns, and 12 measured energy drink or caffeine use. Risky behaviors were measured in 15 of the studies and included topics of drunk or high-risk driving, drug/substance use, misuse of prescription drugs, tobacco use, heavy episodic/binge drinking, location of drinking, risky drinking activities, sexual behavior, and general risk taking. Alcohol consequences were measured in 18 studies, which included short and long-term consequences, including alcohol dependence and Spring Break related problems. Consequences of AmED and ED use were reported in nine studies, which included sleep problems, general side effects, sexual victimization, effects of AmED use on alcohol behaviors, and general short and long-term consequences and outcomes. Personality traits were measured in 12 of the

studies including depression symptoms, athlete status, social context of drinking, impulsivity, AmED attitudes, AmED perceived norms, AmED beliefs, jock identity, masculine norms, activity involvement, living situation, academic demands, Theory of Planned Behavior variables, and general personality traits. Personal motives were measured in 12 of the studies including reasons for CAB use, motivations and reasons for energy drink use, alcohol expectancies, caffeine expectancies, AmED expectancies, CAB expectancies, motivations and reasons for AmED use, and alcohol motives. Neuropsychologic Assessment was measured in one study, and nutrition knowledge was measured in another.

Article 2

Since their introduction to the United States in 1997, energy drinks have gained popularity. This is evidenced by the roughly two-thirds growth in sales from 2008 to 2012, and the projected increase in energy drinks sales in the U.S. estimated at \$32 billion by 2025 (Natural Product Insider, 2013; PR Newswire, 2017). This trend is particularly evident among college students, where 82% of them reported consuming an energy drink at least once in their lifetime and about a third (36.4%) indulged in the past two weeks (Marczinski, 2011). Past 30-day consumption rates range from 22% to 70% (Gallucci, Martin, Hackman, & Hutcheson, 2016; Pettit & DeBarr, 2011), while weekly usage rates vary from 13% to 59% depending on the study (Arria et al., 2011; Pettit & DeBarr, 2011; Poulos & Pasch, 2015; Velazquez et al., 2012).

The consumption rates of energy drinks have been associated to poor academic outcomes, including an inverse relationship between 30-day energy drink consumption and grade point average (Pettit & DeBarr, 2011). Researchers speculate this could be due

to sleep deprivation associated with consuming energy drinks when preparing for last minute deadlines or tests (Pettit & DeBarr, 2011). Indeed, energy drink consumption is linked with poorer sleep quality, taking longer to fall asleep, shorter sleep duration, and thereby accounted for 20% of the variance in sleep disturbance as measured by the Pittsburgh Sleep Quality Index (Stasio, Curry, Wagener, & Glassman, 2011). Furthermore, an association exists between grade orientation and the inability to stop consuming energy drinks (Ianni & Lafrenier, 2014). Previous research shows a relationship between high-grade orientation and academic dishonesty, such as cheating on academic assignment (e.g., plagiarism) (Marsden, Carroll, & Neill, 2005). Ianni & Lafrenier (2014) speculate that students who score high on grade orientation are more likely to look for shortcuts, such as consuming energy drinks, to improve their academic success than their peers.

Other associated behaviors with consuming energy drinks include disordered eating, weight loss attempts, illicit prescription drug use, drunk driving, riding with a drunk driver, and excessive alcohol use (Jeffers, Vatalaro Hill, & Benotsch, 2014; Spierer et al., 2014; Woolsey et al., 2014). Moreover, high frequency energy drink use is linked to heavier alcohol consumption, with related consequences of blacking out, hangovers, drinking to cope, enhancement motives for drinking alcohol, and meeting the criteria for alcohol dependence (Arria et al., 2011; Skewes, DeCou, & Gonzalez, 2013). One of the more serious concerns with energy drink consumption is the rise in emergency department visits, which doubled in a three-year span from 10,000 in 2007 to 20,000 in 2011 (SAMHSA, 2013). Indeed, 1 in 10 of these visits resulted in hospitalization due to adverse reactions such as tachycardia, irregular heartbeat, high-blood pressure, high-

blood sugar, insomnia, headache, nervousness, and seizures (SAMHSA, 2014). Further, higher perceived stress levels are related to 30-day energy drink consumption (Pettit & DeBarr, 2011). In addition to perceived stress levels, the frequency of energy drink use accounted for 29% of the variance in anxiety scores, among a small sample of college students (Stasio, Curry, Wagener, & Glassman, 2011).

Regarding peoples' motive(s) when making decisions pertaining to their health choices, outcome expectancies are particularly useful in explaining and predicting behavior. Expectancies are a construct of the Social Cognitive Theory and are similar to expectations (Bandura, 1986). Expectations are the assumed outcome of a behavior, while expectancies are the positive or negative value a person places on the expectations of an outcome. Expectancies are learned through experience, observation, or suggestion and in turn will influence whether the person performs the behavior (Bandura, 1986; Huntley & Juliano, 2012). Researchers have utilized expectancies to examine the following topics: illicit drug use, alcohol, alcohol mixed with energy drinks, as well as caffeine (Glassman et al., 2012; Hayaki et al., 2010; Huntley & Juliano, 2012; Mallett, Marzell, Scaglione, Hultgren, & Turrisi, 2014).

While expectancies for other substances are well documented, little is known about college students' motivation for consuming energy drinks. To address this gap in the literature, energy drink expectancies of college students were assessed. The purpose of this article was threefold. First, to examine the energy drink expectancies of college students. Second, to determine how much variance the expectancies account for in predicting energy drink consumption. Third, to assess which of the expectancies is most predictive of energy drink consumption. This information may assist college officials and

health practitioners with prevention and education efforts, as well as impacting future policy initiatives.

Research questions investigated include:

1. What associations exist between energy drink consumption and health; specifically, alcohol, illicit drug use, sleep, and mental health?
2. What associations exist between energy drink consumption and academics; specifically, GPA and time management?
3. How many reliable and interpretable components, energy drink expectancies, exist from the sample population?
4. How much variance do the components (energy drink expectancies) account for in predicting energy drink consumption?
5. Which component (energy drink expectancy) will be the most influential in predicting energy drink consumption behaviors?
6. How do energy drink expectancies differ between energy drink users and non-users?
7. What do energy drink users typically do after consuming an energy drink?
8. How quickly do energy drink users consume an energy drink, not including energy shots?

Participants included students from a large public university in the Midwest. After receiving IRB approval, participants were recruited through obtaining a simple random sample. The campus registrar was contacted and provided the researchers with a list of fifty randomly selected undergraduate courses. The inclusion criteria consisted of undergraduate students, between 18 and 25 years old, who were in attendance the day the

survey was distributed in class during the fall semester of 2017. Researchers were granted access to 29 of the 50 randomly identified courses (58%), with four instructors inviting researchers into additional sections or into a main lecture of the same course for additional participant inclusion, for a total of 32 classrooms surveyed. Nine students opted out of taking the questionnaire, for a total of 1,246 participants. While cleaning the data, seven of the participants were removed as they did not meet inclusion criteria, for a final total of 1,239 students.

Participants were given a standardized alcohol and drug survey (Southern Illinois University – Carbondale & Core Institute, 2017) and included customized items concerning energy drink expectancies. The questionnaire consisted of 74-items and included measures of demographics, substance use and behaviors, energy drink expectancies, energy drink behaviors and knowledge, and mental health. Energy drink consumption was measured by lifetime, 30-day, and past week consumption as well as the number typically consumed, the number consumed they last time they had an energy drink, and the most consumed in one sitting.

Descriptive statistics were calculated, which included frequencies, percentages, means, and standard deviations in order to describe the sample population. An exploratory factor analysis was conducted to categorize the energy drink expectancies. Independent samples t-tests and Chi-square analyses were completed to assess the relationships among energy drink consumption and health and academic related variables. A multinomial logistic regression was used to determine how much of the variance the model accounted for and binary logistic regressions were used to determine which of the expectancies held the strongest relationship to energy drink consumption

among college students. The expectancies were coded to reflect whether the answer was positive or negative for the binary logistic regression; neutral responses were omitted.

Energy drink consumption was measured based on past 30-day and past week frequencies. Approximately 32% of the sample consumed energy drinks in the past 30 days, with 18% using in the past-week. Roughly, 10% of the sample used AmEDs in the past 30 days, with 3.7% using AmEDs in the past week. The time it typically took participants to consume an energy drink (not an energy shot) varied, with 13.3% of the sample taking less than 10 minutes, 35.8% took 11 to 20 minutes, 26.2% took 21 to 30 minutes, and nearly a quarter (24.7%) of the sample took over a half hour to finish their drink. Participants indicated the following reasons for consuming energy drinks: wake up, 57.4%; study, 37.7%; taste, 34.3%; concentrate, 19.6%; pay attention in class, 18.2%; thirsty, 18.1%; party, 12.2%; exercise harder, 7.4%; exercise longer, 7.3%; habit, 5.2%; and addicted, 2.8%.

Chi-square analyses were conducted to test the association between energy drink consumption and health variables that included alcohol, illicit drug use, marijuana use, prescription drug use, e-cigarette use, binge drinking, mental health, and sleep problems. Six correlations were found to be significant. Past 30-day energy drink use was significantly associated with illicit drug use, $\chi^2 (2, n=867) = .094, p<.01$; past 30-day marijuana use, $\chi^2 (2, n=867) = .081, p<.05$; past 30-day illicit prescription drug use, $\chi^2 (2, n=868) = .163, p<.01$; and past 30-day e-cigarette use, $\chi^2 (2, n=867) = .077, p<.05$. Past week energy drink consumption was associated with past 30-day illicit prescription drug use, $\chi^2 (2, n=868) = .135, p<.01$; and whether the participant was currently experiencing any mental health issues, $\chi^2 (2, n=872) = .100, p<.01$. Further, a Chi-Square analysis was

conducted to test the association of past 30-day and past week energy drink consumption to GPA, where no significant association was found. Independent samples t-tests were conducted between energy drink consumption and total sleep problems score. Neither past 30-day or past week energy drink consumption were significantly associated. Independent samples t-tests between energy drink consumption and academic variables were conducted, specifically time management score. Past 30-day consumption were not significantly correlated to time management score. However, past week consumption was associated to time management score, 6.90, SD=1.54 compared to 6.64, SD=1.27 for those who did not consume energy drinks in the past week; $t(318) = 2.22, p < .05$. This indicates that past week energy drink consumption was associated to a higher score of time management issues by the participants.

The Principal Components Analysis revealed a Bartlett's test of sphericity run in accordance with the principal components analysis was significant, $\chi^2 = 37070.43, df=703, p < .000$. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .966, indicating the sample was adequate for performing a factor analysis. The expectancies, from the 38-item, seven-factor, energy drink expectancy questionnaire explained 72.5% of the total variance in the original variables. The seven factors were labeled as follows: Withdrawal, Energy Enhancement, Appetite Suppression, Social/Mood Enhancement, Physical Performance Enhancement, Anxiety/Negative Physical Effects (which included sleep disturbance expectancy statements), and Alcohol and Partying.

A multinomial logistic regression was conducted to determine the variance accounted for by the expectancy factors collectively, based on the full scale of each factor, on past 30-day energy drink consumption. Regression results revealed the model

explained 24.3% (Nagelkerke pseudo R^2) of the variance in past 30-day energy drink consumption, with a -2 Log Likelihood of 1034.236. The model correctly classified 69.0% of the cases. Binary logistic regression analyses revealed a significant association between past 30-day energy drink consumption and four positive and negative energy drink expectancies. The odds ratio results show Anxiety/Negative Physical Effects to be the strongest predictor of energy drink consumption. Students who did not think the negative outcomes associated with the Anxiety/Negative Physical Effects expectancy statements would occur were 2.5 times as likely to consume energy drinks in the past 30 days, compared to students who thought they would occur. Further, students who did not believe the outcomes associated with the Withdrawal expectancy statements would occur were 1.6 times as likely to consume energy drinks in the past 30 days, compared to those who thought they would occur. Additionally, students who thought energy drink use would provide an energy boost (Energy Enhancement Expectancy) were 2.2 times as likely to consume energy drinks in the past 30 days, compared to students who did not believe they would feel an increase in energy after consuming energy drinks. Lastly, students who believed energy drink use would make them more social or increase their mood (Social/Mood Enhancement Expectancy) were 1.5 times as likely to consume energy drinks in the past 30 days, compared to students who did not think social or mood benefits would occur.

Binary logistic regressions were also conducted between lifetime energy drink use and positive and negative expectancy statements, to see if expectancies differed between users and non-users. With the exception of the Energy Enhancement factor, each of the expectancies were significant, showing users did not believe the expectancy statements

would come to fruition (held negative expectancies) more so than non-users. Further, the odds ratios for those with negative expectancies ranged from 2.15 to 3.26 times as likely to consume an energy drink in their lifetime as those with positive expectancies (see Table 4).

The expectancies of 30-day users differed from those who had consumed an energy drink at least once in their lifetime. Past 30-day users believed (held positive expectancies) the Energy Enhancement and Social/Mood Enhancement expectancy statements would occur, while lifetime users did not believe (held negative expectancies) any factors would occur, with the exception of Energy Enhancement. This could indicate that energy drink expectancies change over time. It is possible that some participants tried an energy drink once or a limited number of times, and did not enjoy the outcome. It is also possible that 30-day users have a greater tolerance for the same effects that prevented others from continuing to use this product. This is an area of research warranting further investigation.

[Insert Table 4]

Failed to Reject Hypotheses

Article 1

Given the nature of the study in Article 1, there were no hypotheses.

Article 2

The following 2 out of 6 (33.3%) null hypotheses resulted in a failed to reject outcome:

- Hypothesis 1.1: Among the college students in the sample population, no associations exist between energy drink consumption and alcohol, illicit drug use, sleep, nor mental health
 - There were no significant associations found between energy drink consumption and any alcohol measure nor any sleep measure.
- Hypothesis 2.1: Among the college students in the sample population, no associations exist between energy drink consumption and GPA nor time management.
 - There was no significant relationship found between energy drink consumption and GPA.

Rejected Hypotheses

Article 1

Given the nature of the study in Article 1, there were no hypotheses.

Article 2

The following 6 out of 6 (100%) null hypothesis were rejected:

- Hypothesis 1.1: Among the college students in the sample population, no associations exist between energy drink consumption and alcohol, illicit drug use, sleep, nor mental health.
 - Associations between energy drink consumption and illicit drug use (including marijuana and prescription drug misuse), E-cigarette use, and mental health were found to be significant. Past 30-day energy drink consumption was found to be significant with past 30-day illicit drug use, marijuana use, prescription drug misuse, and E-cigarette use. Past week

energy drink consumption was found to be significant with whether the participant was experiencing mental health issues at that time.

- Hypothesis 2.1: Among the college students in the sample population, no associations exist between energy drink consumption and GPA nor time management.
 - Associations between energy drink consumption and time management were found to be significant. Past week energy drink consumption and a time management score that was based off of three questions were found to be significant (e.g., please rate how often you procrastinate, or wait until the last minute, to complete your work; please rate how often you feel like you are behind with your work; how would you rate your time management skills).
- Hypothesis 3.1: In the sample population, no reliable or interpretable components, energy drink expectancies, will exist from the sample population.
- Hypothesis 4.1: The components (energy drink expectancies) will account for no variance in predicting energy drink consumption among the college students in the sample population.
- Hypothesis 5.1: The components (energy drink expectancies) will not differ from one another.
- Hypothesis 6.1: Energy drink users and non-users' expectancies will not differ.

Discussion

Article 1

While literature reviews addressing AmEDs exist, none have been conducted solely on the college student population. Regarding substance abuse, college students are a high-risk population, therefore the need to summarize the research on this topic is apparent. The present review search criteria yielded 35 studies that met the inclusion criteria and examined college students and AmEDs, the associated behaviors and consequences of consuming AmEDs, and the motivations of using AmEDs. The first article regarding energy drinks and college students was published in 2007; however, most of the research on this topic has occurred since 2013. The recent increase in the number of studies may be due to the growing concern of AmED consumption and the related consequences college students' experience. The studies were analyzed based on scientific rigor, with regard to purpose, study design, location, target population, sample size, response rate, validity and reliability, measured outcomes, main results, and limitations were queried. The study results were organized topically, as well.

As with any type of research, including systematic reviews, limitations exist. While a thorough review strategy was employed, some research may have been unintentionally missed. This was minimized by using a thorough and diverse search strategy, which included web-based search engines, the reference sections of each article, and applying multiple key terms for each search. In some studies, authors may not have controlled for, discussed, or tracked whether participants consumed energy drinks while drinking alcohol (non-mixing of the two) versus mixing an energy drink with alcohol (e.g., "Red Bull® & vodka"). While the different ways drinks are marketed toward consumers could influence consumption patterns, how they were consumed in relation to one another may be a moot point as alcohol and energy drinks are digested virtually the

same either way. The array of research methods used in the studies (study population, campus size, response rates, and reliability and validity) make it difficult to contribute specific conclusions concerning the research in this area. Lastly, unpublished studies undoubtedly exist and may contain useful information. However, assessing them is not feasible.

Article 2

Energy drinks have gained popularity since their introduction the U.S. in the late '90s. Consuming energy drinks have been associated with serious health consequences, including emergency room visits and hospitalization (SAMHSA, 2013; SAMHSA, 2014). Given their economic growth and increased use among populations, especially college students, even when there are well-documented risks associated with consumption; it is crucial to explore the reasons why they are consumed. The purpose of this study was to examine college students' motivations for consuming energy drinks and, further, which of these expectancies is strongest in influencing consumption. This study is unique, because it is the first to explore the positive and negative energy drink expectancies among a sample of U.S. college students.

Roughly 30% of the sample consumed energy drinks in the past 30-days, while approximately 10% used AmEDs in the past 30-days; the prevalence rates are consistent with previous research (Gallucci, Martin, & Morgan, 2016; Miller, 2008; Snipes et al., 2015; Velazquez, Poulos, Latimer, & Pasch, 2012). The speed of which energy drinks were consumed, aside from energy shots, varied from less than 10 minutes to more than 30 minutes. Moreover, about 60% of participants reported that it typically took 11 to 30 minutes to consume an energy drink. Students also indicated the various reasons for

consuming energy drinks, the most common were to wake up, study, taste, concentrate, and pay attention in class; which also has been reported in the research (Bulut et al., 2014; Gallucci, Martin, & Morgan, 2016; Hardy, Kliemann, Evansen, & Brand, 2017; Malinauskas et al., 2007).

A principal components analysis was conducted to determine how the expectancy statements grouped with one another. The factor analysis revealed seven factors including, Withdrawal, Energy Enhancement, Appetite Suppression, Social/Mood Enhancement, Physical Performance Enhancement, Anxiety/Negative Physical Effects, and Alcohol and Partying. Using the seven factors, a multinomial logistic regression analysis indicated the model accounted for 24.3% of the variance in past 30-day energy drink consumption. In past research, combined alcohol and caffeine expectancies accounted for 12% of the variance in CAB use quantity. When separated, alcohol expectancies account for approximately 10%, while caffeine expectancies account for 6% (Lau-Barraco & Linden, 2014). The variance *expectancy* related research typically explains ranges from 6% to 43%, with most falling below 30% (Brackenbury, Ladd, & Anderson, 2016; Glassman, et al., 2012; McBride, Barrett, Moore, & Schonfeld, 2014; Spillane, Combs, Kahler, & Smith, 2013; Stamates, Lau-Barraco, & Linden-Carmichael, 2016; Zamboanga, 2006).

The binary logistic regression analyses, which compared positive and negative expectancy scores, yielded four significant odds ratios between expectancy factors and 30-day energy drink consumption. Anxiety/Negative Physical Effects was the strongest expectancy, where students who did not believe the expectancy statements (held negative expectancies) were 2.5 times as likely to engage in past 30-day energy drink consumption

as those with positive expectancy scores. Huntley & Juliano (2012) reported similar findings concerning expectancies where anxiety/negative physical effects and sleep disturbances were negatively associated with frequency and quantity of caffeine use. Further, participants who did not believe with the expectancy statements (held negative expectancies) concerning withdraw were 1.6 times as likely to consume energy drinks in the past 30 days as those reporting positive expectancy scores.

Energy enhancement was the strongest positive expectancy. Students who felt the energy enhancement expectancy statements were true (held positive expectancies) were 2.2 times as likely to use energy drinks in the past 30 days as those reporting negative expectancies. Indeed, related research consistently indicates that people consume energy drinks to study or work longer and/or more efficiently (Bulut et al., 2014; Gallucci, Martin, & Morgan, 2016; Hardy, Kliemann, Evansen, & Brand, 2017; Malinauskas et al., 2007). Aggressive marketing strategies used by energy drink companies towards college students may also contribute to this expectancy; which is unfortunate given the negative relationship between energy drinks consumed during the last occasion and the past 30-days energy drink consumption and GPA reported in the literature (Champlin, Pasch, & Perry, 2016; Howland et al., 2011; Jones, Barrie, & Berry, 2012; Reissig, Strain, & Griffiths, 2009). Social/Mood Enhancement was also a significant predictor, where students who believed the expectancy statements (held positive expectancies) were 1.5 times as likely to consume energy drinks in the past 30 days, compared to those with negative expectancy scores. The results of this study can be useful in creating prevention efforts in order to mitigate energy drink use among college students. This can be

accomplished through education-based interventions, which teach students about the assumptions (i.e., expectancies) people have concerning energy drinks.

While the findings provide evidence that energy drink expectancies predict energy drink consumption, they are not without limitations. First, causal inferences cannot be made from a cross-sectional design. Self-reported data were collected for this study. The sensitive nature of some of the questions could have caused students to underreport or over-report their use, while others may have simply been unable to accurately recall their use. Further, students could have provided socially desirable answers, due to behaviors being illegal or viewed negatively. The population was limited to undergraduate college students, ages 18 to 25, at a mid-sized public university in the Midwest, thus the results may not be generalizable to other universities. Selection bias is a concern, as the questionnaire was only available to those who were present that particular day in class. Even though a definition for an energy drink was described in the instrument, there is a lack of a common set of guidelines for the definition of an energy drink. Lastly, the questionnaire contained 74-items and was long, thus survey fatigue could have compromised the accuracy of the responses.

Recommendations

The following recommendations are presented based on the systematic literature review and the results of the cross-sectional questionnaire. The recommendations are subdivided at the *college health practitioner, campus administration, research and grantor levels, state and federal levels*.

College Health Practitioner Level

- College health practitioners should create or expand education materials to more effectively educate students on topics of ED and AmED consumption.
- Further, health education campaigns can be used to inform students on the physical consequences of consuming EDs and AmEDs.
- Health communication campaigns can be used to challenge existing expectancies in an effort to curb ED consumption and AmEDs.
- It is also important for campus health personnel to stay up-to-date with new substance use/abuse trends including the evolution of ED consumption. Ongoing conversations with students and routinely reading academic journals, is vital for staying informed.

Campus Administration Level

- Ensure ED and AmED use is included in future campus health assessments.
- The campus' ATOD point person needs to establish EDs and AmEDs as a focus of the institution's strategic plan to address student wellness.

Researcher and Grantor Level

- There is a strong need for a national data source for ED and AmED consumption among college students.
 - A national data set would allow other intuitions to benchmark their data, so they can prioritize prevention efforts.
- Research needs to be conducted with more rigor, with specific focus on using randomized sampling methods, reporting response rates, and including reliability and validity measures.

- Editors and reviewers need to be consistent in holding submissions to high-standards concerning the peer-review process.
- Advocate for additional funding to conduct intervention-based research to reduce ED and AmED use.

State and Federal Level

- Require the industry to place warning labels on EDs about not only the caffeine levels and stimulant effects, but also addressing the dangers of mixing with alcohol or consuming alongside an alcoholic beverage.
 - Currently, this is not mandated (Allgood, 2016; Crawford & Goslinger, 2017; Energy Drinks Lawsuit, 2018; University of Maryland, 2014).
- Due to the inherent danger in mixing alcohol with EDs, states need to pass a policy, prohibiting the promotion and consumption of EDs and AmEDs at restaurants.
 - As previously mentioned, this could include daily bar specials directed at promoting AmEDs.

Synthesis of Articles

Energy drinks have only existed in the U.S. for roughly twenty years, and yet the popularity and growth in sales of these beverages has been significant with estimates of the U.S. market reaching \$32 billion by 2025 (PR Newswire, 2017). Energy drink consumption among college students is linked with a multitude of consequences such as eating disorders, illicit prescription drug use, hazardous drinking, drunk driving, and alcohol-related problems (Arria et al., 2011; Jeffers, Vatalaro Hill, & Benotsch, 2014;

Skewes, DeCou, & Gonzalez, 2013; Spierer et al., 2014; Woolsey et al., 2014). Indeed, the impact that energy drinks and AmEDs have on college students is well documented. The systematic literature review in Chapter Two contributes to the existing body of knowledge, by summarizing the research on U.S. college students and AmEDs. Multiple trends were discovered in this analysis including the consequences related to hazardous drinking patterns, drinking behaviors such as drunk driving, personality traits and their impact on AmED use, drug abuse, sexual assault risk, and alcohol dependence issues. From the literature review, a knowledge gap existed with regards to examining energy drink expectancies. This knowledge gap lead to the cross-sectional study that was conducted to assess the energy drink expectancies of college students and their relation to energy drink use. While this study addressed the gap in the research, other questions still remain.

Future Research

While energy drinks continue to grow in popularity among college students, few interventions aimed at curbing this behavior have been successfully implemented. This wide range of use, combined with the behaviors and consequences associated with energy drink use, necessitates additional research. Future research should focus on both qualitative and quantitative designs. Qualitative research should examine, in detail, why college students use energy drinks. For example, what are the characteristics (reasons, motivations, mode of consumption, and when they are consumed), surrounding energy drink consumption among college students? Determining these characteristics in a qualitative design allows researchers to have a better understanding of how, why, and when energy drinks are being consumed.

Quantitative studies need to be conducted using longitudinal and intervention designs. Time series research should be administered to identify when college students consume energy drinks. Further, fluctuations in use should be explored with respect to time of day, days of week, and times in the semester (e.g., *mid-terms and finals*). Additionally, researchers should assess changes from year to year as students go through their college careers. The results of these questions can better equip campus health practitioners in creating interventions to mitigate the hazards associated energy drink use. Intervention research, utilizing experimental designs, can examine how health communication campaigns can impact energy drink consumption, such as the utilization of social norms theory (e.g., “70% of UT students have not consumed an energy drink in the last 30 days”). Social marketing campaigns that utilize the 4P’s (Product, Price, Place, & Promotion) can also be utilized to challenge energy drink expectancies; based on the perceived benefits, the health cost they create, how the product is sold, and how the product is marketed towards consumers (Kotler & Lee, 2016). Health education campaigns can be created that highlight the risk associated with EDs and AmEDs as well as providing harm reduction strategies for consumption of these products. Intervention-based research can provide researchers with insight concerning efficacious strategies to limit energy drink consumption.

Summary

This chapter provided an overview of the major findings reported in articles one and two. Additionally, summaries of the accepted and rejected hypotheses were included. The key findings were summarized, while placing them in the context of current literature. A brief description of how the two studies were intertwined was provided.

Table 1			
<i>Logistic Regression: Positive and Negative Energy Drink Expectancies and Lifetime ED Use</i>			
<u>Expectancy Factors</u>	<u>Odds Ratio</u>	<u>CI</u>	<u>p-Value</u>
Withdrawal Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	3.26	2.47 – 4.31	<.001
Anxiety/Negative Physical Effects Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.82	2.13 – 3.73	<.001
Social/Mood Enhancement Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.34	1.76 – 3.10	<.001
Physical Performance Enhancement Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.27	1.72 – 3.01	<.001
Appetite Suppression Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.20	1.60 – 3.01	<.001
Alcohol and Partying Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	2.15	1.57 – 2.85	<.001
Energy Enhancement Expectancy			
Agree (Positive)	REF	-	
Disagree (Negative)	1.32	0.99 – 1.74	.051

Lastly, recommendations for practitioners and researchers were delineated, followed by possible research questions for future studies.

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Appendix A

Journal of Alcohol and Drug Education

GUIDELINES FOR MANUSCRIPT PREPARATION

NOTE: Beginning January 1, 2018, all manuscripts and letters to the editor approved for publication will be charged a \$40.00 administrative processing fee.

The Journal of Alcohol and Drug Education encourages submission of manuscripts based on empirical studies, reviews (including meta-analyses), theoretical propositions, methodological critiques, case studies, book reviews, and letters to the editor pertaining to alcohol, tobacco, and other drugs. Educational and ecological intervention studies are especially encouraged. Empirical studies, reviews, theoretical and methodological articles, and case studies receive blind peer-review by three reviewers; letters to the editor and book reviews are reviewed only by the editors. Manuscripts submitted to the Journal of Alcohol and Drug Education must follow these guidelines:

1. Manuscripts must be prepared in accordance with the Publication Manual of the American Psychological Association (5th edition).
2. Manuscripts based on empirical studies, reviews, theoretical and methodological articles, and case studies should not exceed twenty double-spaced pages with one-inch margins on all sides. This page length includes the tables and references but excludes the title page and the abstract page.
3. The letters to the editor should not exceed ten double-spaced pages including no more than 10 references. An abstract or cover page should not be submitted with a letter to the editor, and the letter must begin with "Dear Editor:" and must include a title. The name(s) and affiliation(s) of the writer(s) must be stated before the references in the letters to the editor.
4. The book reviews should not exceed more than five double-spaced pages including any references.
5. The preferred style of font, as suggested by the Publication Manual of the American Psychological Association, is 12 point serif (e.g., Times Roman or Courier) for text and sans serif (e.g., Arial or Franklin Gothic) for figures and tables.
6. Tables and figures must be camera ready.
7. The abstract should not be more than 120 words.
8. The *Journal of Alcohol and Drug Education* accepts only original articles. Simultaneous submissions to other journals are not permitted, and a statement

confirming this must be included in the transmittal letter. Although submission and acceptance of a manuscript implies transfer of copyright to the Journal of Alcohol and Drug Education, a signed Consent to Publish and Transfer Copyright is also required.

9. Conflict of interest including financial support, any other colleagues' professional contributions, any earlier professional presentations, and any other relationships must be explained in the author notes section.
10. The manuscripts are sent for blind review to three reviewers based on the criteria of:
 - a. Originality
 - b. Level of interest to readers
 - c. Format, organization, and adherence to guidelines
 - d. Recent nature of work
11. The reviewers rate each manuscript based on the criteria of:
 - a. Contribution to the field
 - b. Methodology
 - c. Scientific accuracy
 - d. Writing style
12. The reviewers recommend:
 - a. Acceptance
 - b. Acceptance with minor revisions
 - c. Acceptance with major revisions
 - d. Rejection
 - e. Recommendation for submission to another journal
13. For the manuscript to be considered for publication, two reviewers must recommend acceptance. Final decision is made by the Editor, Manoj Sharma, MBBS, MCHES, Ph.D., Professor, Behavioral Health Promotion & Education, Jackson State University, 350 W. Woodrow Wilson Dr., Jackson, MS 39213; phone (601)979-8850; fax (601)979-8848; email: manoj.sharma@jsums.edu
14. Beginning in January 2012, the author(s) must electronically submit a manuscript as a Microsoft Word file (.doc) to:

Jamie LaVigne, Editorial Coordinator,
Journal of Alcohol and Drug Education
jamielavigne@comcast.net; (517) 980-1921

When a manuscript is accepted for publication, the author(s) must send it with any changes requested by reviewers as a Microsoft Word file (.doc) to Editorial Coordinator,

Jamie LaVigne. Proofs are not provided.

15. A request for approval to reprint specific articles should be addressed to CCC, a nonprofit organization that provides licenses and registration for a variety of users.

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(734) 302-7500 or (800) 420-NAPC;
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17. **Beginning January 1, 2018, all manuscripts and letters to the editor approved for publication will be charged a \$40.00 administrative processing fee. This fee is non-refundable and will be due after you have been notified that your submission has been approved for publication. Anyone requesting a “financial hardship” waiver for this fee will need to contact JADE’S Editor, Dr. Manoj Sharma directly at manoj.sharma@jsums.edu or (601) 979-8850.**

Appendix B

Journal of American College Health Guidelines for Manuscripts

This journal uses ScholarOne Manuscripts (previously Manuscript Central) to peer review manuscript submissions. Please read the [guide for ScholarOne authors](#) before making a submission. Complete guidelines for preparing and submitting your manuscript to this journal are provided below.

Please note that The Journal of American College Health uses [CrossCheck™](#) software to screen papers for unoriginal material. By submitting your paper to The Journal of American College Health you are agreeing to any necessary originality checks your paper may have to undergo during the peer review and production processes.

The Journal of American College Health provides information related to health in institutions of higher education. The journal publishes articles encompassing many areas of this broad field, including clinical and preventive medicine, environmental and community health and safety, health promotion and education, management and administration, mental health, nursing, pharmacy, and sports medicine.

The Journal of American College Health is intended for college health professionals: administrators, health educators, nurses, nurse practitioners, physicians, physician assistants, professors, psychologists, student affairs personnel, and students as peer educators, consumers, and preprofessionals.

The journal publishes (1) scientific or research articles presenting significant new data, insights, or analyses; (2) state-of-the-art reviews; (3) clinical and program notes that describe successful and innovative procedures; and (4) viewpoints, book reviews, and

letters to the editor. All content must go through a rigorous peer-review process before being selected for publication.

Types of Articles

Major Articles

Theoretical, scientific, and research manuscripts and reviews will be considered as major articles. The preferred length is 15 to 20 double-spaced pages (4,000–6,000 words), including tables, figures, and references.

Case Reports

The Journal of American College Health seeks to publish cases with clinically valuable lessons for college health professionals. Therefore, we encourage submissions that outline cases which present a diagnostic, ethical or management challenge, or that highlight aspects of mechanisms of injury, pharmacology or histopathology that are deemed of particular educational value for college health professional. These papers are limited in length to 2,000 words (excluding the title page, abstract, acknowledgments, references, tables, and figures). Case Reports may address, but are not limited to: important clinical lessons learned from practice, emerging pathogenesis pertinent to college health, lessons learned from practice, rare conditions, and novel diagnostic criteria or measurement practices.

Brief Reports

Brief Reports may fall into one of two categories: (1) describe new methods, techniques, or topics of general interest to the field of college health or (2) present the results of experiments/investigations that can be concisely reported with up to one table or figure. These papers are limited in length to 2,000 words (excluding the title page,

abstract, acknowledgments, references, tables, and figures). Overall, Brief Reports are intended to highlight interesting findings that do not warrant the space required of an original article.

Viewpoint

Viewpoint is a forum for opinions. Topics may be ethical, organizational, social, professional, or economic. Debate on controversial subjects is welcome. Manuscripts vary from 4 to 10 pages (1,000–2,500 words), but we prefer concise presentations. Tables and figures are unnecessary. References should follow the same format as that used in major articles.

Letters to the Editors

Letters to the Editors in response to published articles are also welcome. They should be brief (500–1,000 words), and they may be edited.

Manuscript Preparation

1. Submit your manuscript, including tables, as double-spaced Word files with minimal formatting in Times. Save it as a .doc, .rtf, or .ps file. Please use simple filenames and avoid special characters. Do not use wordprocessing styles, forced section or page breaks, or automatic footnotes or references.
2. Follow the *American Medical Association Manual of Style (AMA)*, 10th edition, in medical and scientific usage. Please consult our guidance on keywords [here](#).
3. Abstract must be no longer than 150 words, be written in AMA format, and include these words as subheadings: Objective, Participants, Methods, Results, and Conclusions.

The Participants section must include the month and year in which research was conducted.

4. Text in research articles must be divided into these headings: Methods, Results, and Comment (which must include the subheadings Limitations and Conclusions).
5. Proofread carefully, double-checking all statistics, numbers, symbols, references, and tables. Authors are responsible for the accuracy of all material submitted.
6. Indicate approval of the appropriate institutional review board (IRB) for all studies involving human participants and describe how participants provided informed consent.
7. Provide written permission from publishers and authors to reprint or adapt previously published tables or figures.

Submitting Your Manuscript in Manuscript Central

When your files are ready, visit the online submission Web site: <http://mc.manuscriptcentral.com/jach>

1. First, log into the system. Register, if you have not done so before, by clicking on the Create Account button on the log-in screen and following the on-screen instructions.
2. To submit a new manuscript, go to Author Center, then click on Submit a Manuscript and follow the on-screen instructions.
3. Enter your manuscript data into the relevant fields.
4. When you upload your manuscript files via the File Upload screen, Manuscript Central will automatically create a PDF and HTML document of your main text

and any figures and tables that you submit. This document will be used when your manuscript undergoes peer review.

5. Attach 1 blinded manuscript file for review, with all identifying information included in a title page that is identified as “TITLE PAGE” and submitted separately.

Data sharing policy

This journal applies the Taylor & Francis [Basic Data Sharing Policy](#). Authors are encouraged to share or make open the data supporting the results or analyses presented in their paper where this does not violate the protection of human subjects or other valid privacy or security concerns.

Authors are encouraged to deposit the dataset(s) in a recognized data repository that can mint a persistent digital identifier, preferably a digital object identifier (DOI) and recognizes a long-term preservation plan. If you are uncertain about where to deposit your data, please see [this information](#) regarding repositories.

Authors are further encouraged to cite any data sets referenced in the article and provide a [Data Availability Statement](#).

At the point of submission, you will be asked if there is a data set associated with the paper. If you reply yes, you will be asked to provide the DOI, pre-registered DOI, hyperlink, or other persistent identifier associated with the data set(s). If you have selected to provide a pre-registered DOI, please be prepared to share the reviewer URL associated with your data deposit, upon request by reviewers.

Where one or multiple data sets are associated with a manuscript, these are not formally peer reviewed as a part of the journal submission process. It is the author's

responsibility to ensure the soundness of data. Any errors in the data rest solely with the producers of the data set(s).

Editorial Procedures

All submissions are blind reviewed by at least 1 consulting editor or ad hoc reviewer, a statistical reviewer (when appropriate), and an executive editor. The process may take up to 4 months. The managing editor will notify authors of the decision—accept, revise, or reject. Review comments will be returned to the author.

Taylor & Francis Group, LLC reserves the right to edit accepted manuscripts for clarity, coherence, and felicity of style. Authors receive an edited draft to proof, answer queries, and correct errors that may have been introduced in the editing process. Extensive changes and rewriting are not permitted at this stage.

Accepted manuscripts are usually published within 1 year of acceptance.

As an author you are required to secure permission if you want to reproduce any figure, table or extract text from any other source. This applies to direct reproduction as well as "derivative reproduction" (where you have created a new figure or table which derives substantially from a copyrighted source).

References

References should be presented in a separate section at the end of the document, in accordance with *AMA Manual of Style* (10th ed.) guidelines. The references should be listed and numbered based on the order of their first citation. Every reference should be assigned its own unique number. References should not be repeated in the list, with each mention given a different reference number, nor should multiple references be combined under a single reference number. Superscripted digits should be used for in-text citations

Superscripted citations should only follow terminal punctuation (e.g., periods, commas, closed quotation marks, question marks, exclamation points). Reference numbers should not be subscripted.

Author listings in references should be formatted as indicated below.

<i>1 author</i>	Smith A.
<i>2 to 6 authors</i>	Smith A, Jones B, Smythe C, Jonesy D, Smitty E, Jonesi F.
<i>7 or more authors</i>	Smith A, Jones B, Smythe C, et al.

Models from US National Library of Medicine (NLM) resources (e.g., MEDLINE, Index Medicus) should be employed for abbreviating journal titles in the reference section.

Examples of common reference types appear below.

<i>Journal article</i>	12. Taylor J, Ogilvie BC. A conceptual model of adaptation to retirement among athletes: a meta-analysis. <i>J Appl Sport Psychol.</i> 1994;6(1):1–20. doi:10.1080/10413209408406462.
<i>Book</i>	2. Duke JA. <i>Handbook of Phytochemical Constituents of GRAS Herbs and Other Economic Plants</i> . Boca Raton, FL: CRC Press; 2001.
<i>Book with titled volume and edition</i>	18. Bowlby J. <i>Loss: Sadness and Depression</i> . Vol. 3 of <i>Attachment and Loss</i> . 3rd ed. New York, NY: Basic Books; 1982.
<i>Edited book chapter</i>	34. Gordon S, Lavalley D. Career transitions in competitive sport. In: Morris T, Summers J, eds. <i>Sport Psychology: Theory,</i>

	<i>Applications and Issues</i> . 2nd ed. Brisbane, Australia: Wiley; 2004:584–610.
<i>Edited book chapter with volume and edition</i>	26. Remael A. Audiovisual translation. In: Gambier Y, van Dooslaer L, eds. <i>Handbook of Translation Studies</i> . Vol. 1. 2nd ed. Amsterdam, Netherlands: John Benjamins; 2012:12–17.
<i>Online/Website</i>	8. United States Census Bureau. American housing survey: 2013 detailed tables . United States Census Bureau Web site. http://www.census.gov/newsroom/press-releases/2014/cb14-tps78.html . Published October 16, 2014. Accessed October 21, 2014.
<i>Dissertation/Thesis</i>	26. Allison N. <i>Bacterial Degradation of Halogenated Aliphatic Acids</i> [dissertation]. Nottingham, UK: Trent Polytechnic; 1981.
<i>Conference presentation</i>	4. Alfermann D, Gross A. Coping with career termination: it all depends on freedom of choice. Paper presented at: 9th Annual World Congress on Sport Psychology; January 23, 1997; Netanya, Israel.
<i>Paper/Report</i>	55. Grigg W, Moran R, Kuang M. <i>National Indian Education Study</i> . Washington DC: National Center for Education Statistics; 2010. NCES publication 2010-462.
<i>Newspaper</i>	22. Protzman, F. Clamor in the East: East Berliners explore land long forbidden. <i>New York Times</i> . November 10, 1989:A1, A14.

<i>Patent</i>	67. Pfeifer A, Muhs A, Pihlgren M, Adolfsson O, Van Leuven F, inventors; AC Immune S.A, Katholieke Universiteit Leuven, assignees. Humanized tau antibody. US patent 9,657,091. May 23, 2017.
<i>Computer software with developer</i>	10. Noguera J, Cumby C. <i>SigmaXL</i> [computer software]. Version 8.0. Kitchener, Canada: SigmaXL, Inc; 2017.
<i>Computer software without developer</i>	76. <i>SPSS Amos</i> [computer software]. Version 22.0. Armonk, NY: IBM; 2013.
<i>Dataset</i>	3. Wang, G-Y, Zhu Z-M, Cui S, Wang J-H. Data from: glucocorticoid induces incoordination between glutamatergic and GABAergic neurons in the amygdala [dataset] . Dryad Digital Repository. https://doi.org/10.5061/dryad.k9q7h . Published August 11, 2017. Accessed December 22, 2017.

Illustrations

Illustrations submitted (line drawings, halftones, photos, photomicrographs, etc.) should be clean originals or digital files. Digital files are recommended for highest quality reproduction and should follow these guidelines:

- 300 dpi or higher
- Sized to fit on journal page
- EPS, TIFF, or PSD format only
- Submitted as separate files, not embedded in text files

Color Illustrations

Color art will be reproduced in color in the online publication at no additional cost to the author. Color illustrations will also be considered for print publication; however, the author will be required to bear the full cost involved in color art reproduction. Please note that color reprints can only be ordered if print reproduction costs are paid. Print Rates: \$400 per figure for the first four figures; \$75 per figure for five or more figures. Art not supplied at a minimum of 300 dpi will not be considered for print.

Tables and Figures

Tables and figures (illustrations) should not be embedded in the text, but should be included as separate sheets or files. A short descriptive title should appear above each table with a clear legend and any footnotes suitably identified below. All units must be included. Figures should be completely labeled, taking into account necessary size reduction. Captions should be typed, double-spaced, on a separate sheet.

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Appendix C

University of Toledo Student Health Survey

Every two years The University of Toledo explores behaviors and beliefs related to alcohol, tobacco, and other drugs. Completing this survey will help identify and set priorities for health programs and services on campus. Your participation and **honest** answers are crucial for assessing these issues.

You must be at least 18 years old to complete this survey and your participation is voluntary. You do not have to answer any questions you do not wish to answer. Participation involves no anticipated risks and your responses are **anonymous**.

Thank you in advance for your cooperation.

1. What is your current year in school?
☐ 1st year
☐ 2nd year
☐ 3rd year
☐ 4th year
☐ 5th+ year
2. What year were you born?
19 ____
3. What is your race?
☐ American Indian/Alaskan Native
☐ Asian
☐ Native Hawaiian, Pacific Islander
☐ White
☐ Black
☐ Multiracial
☐ Other
4. Are you of Hispanic origin?
☐ Yes
☐ No
5. What is your gender?
☐ Male
☐ Female
☐ Transgender
☐ Other
6. What is your major? _____
7. From what college are you seeking your degree?
☐ Arts and Letters
☐ Business and Innovation
☐ Education
☐ Engineering

- _____ Health and Human Services
- _____ Honors
- _____ Medicine and Life Sciences
- _____ Natural Sciences and Mathematics
- _____ Nursing
- _____ Pharmacy and Pharmaceutical Services
- _____ University College

8. Are you involved in any of the following campus groups/associations? (Please check 'Yes' or 'No')	Yes	No
Social Fraternity		
Social Sorority		
Varsity Athletics		
Student Government		
Professional Clubs/Associations		
Club Sports		
Intramural Sports		
Other Student Organizations		

9. Do you live on-campus or off-campus?

- _____ On-campus
- _____ Off-campus

10. Do you work?

- _____ Yes, part time (<40 hours/week)
- _____ Yes, full time (≥40 hours/week)
- _____ No

11. What is your cumulative grade point average? (choose one)

- _____ A (3.67 – 4.0)
- _____ B (2.70 – 3.66)
- _____ C (1.70 – 2.69)
- _____ D (0.70 – 1.69)
- _____ F (0.00 – 0.69)

For the remainder of the questionnaire, please keep the following definition in mind:

**An alcoholic drink is defined as being 12-ounces of beer (5% alcohol content), 8-ounces of malt liquor (7% alcohol content), 5-ounces of wine (12% alcohol content), or 1.5-ounces, or a shot, of 80-proof (40% alcohol content) distilled spirits or liquor.*

12. The last time you “partied”/ socialized, how many alcoholic drinks did you have?
(If you do not drink alcohol, please enter “0” and skip to Question 18)

_____ # of Drinks

13. During the last 2 weeks, how many times have you had 5 or more (males) or 4 or more (females) drinks*, containing any kind of alcohol in a two-hour period?

_____ # of Times

14. What is the average number of drinks* you consume in a week?

_____ # of Drinks

15. What is the largest number of drinks* you consumed on one occasion?

_____ # of Drinks

16. Please check one response for each line. (If you do not drink alcohol or use recreational drugs, please skip to question 18.)

During this academic school year, due to your own alcohol or recreational drug use, have you:	Yes	No
a. Been unable to do your homework?		
b. Been unable to study for a test?		
c. Missed a day (or part of a day) of school?		
d. Received a lower grade on an exam or important project?		
e. Received a lower grade in one or more courses?		
f. Received an incomplete or dropped one or more courses?		
g. Been on academic probation?		
h. Missed a semester of school?		
i. Considered dropping out of school?		
j. Gotten into arguments?		
k. Gotten into physical fights?		
l. Gotten in trouble with the police?		
m. Gotten in trouble with a RA or hall director?		
n. Physically injured another person?		
o. Had sex with someone without their consent?		
p. Been told by a friend to cut down on drinking?		
q. Been embarrassed by your behavior?		
r. Forgot where you were or what you did?		
s. Did something you later regretted?		

During this academic school year, due to your own alcohol or recreational drug use, have you:	Yes	No
t. Spent more money than you intended?		
u. Went to school drunk, high, or under the influence?		
v. Went to work drunk, high, or under the influence?		
w. Driven while drunk, high, or under the influence of another drug?		
x. Were sexually assaulted (had sex without giving your consent)?		
y. Fainted or passed out suddenly?		
z. Had a hangover?		
aa. Experienced alcohol poisoning?		
bb. Had unprotected sex?		
cc. Physically injured yourself?		
dd. Been taken to the emergency room?		
ee. Overdosed on drugs?		
ff. Had to seek medical care for energy drink use?		

17. During the past 30 days, on how many days did you have each of the following: (If you did not use, please enter "0")

Alcohol (beer, wine, liquor)	_____ days
Amphetamines (diet pills, speed)	_____ days
Club Drugs (Ketamine, Rohypnol, GHB)	_____ days
Cocaine (crack, rock, freebase)	_____ days
Designer drugs (ecstasy, MDMA)	_____ days
E-cigarettes (vape)	_____ days
Hallucinogens (LSD, PCP)	_____ days
Inhalants (glue, solvents, gas)	_____ days
Marijuana	_____ days
Methamphetamine (crystal meth)	_____ days
Opiates (heroin)	_____ days
Sedatives (downers)	_____ days
Steroids	_____ days
Tobacco (smoke, chew, snuff, hookah)	_____ days
Other illegal drugs (Please list:_____)	_____ days

18. During the past 30 days, on how many days have you used any of the following substances that were NOT prescribed to you? (If you did not use, please enter "0")

Antidepressants (Celexa, Lexapro, Prozac, Paxil, Zoloft, Wellbutrin)

_____ days

Depressants (Xanax, Valium, Ativan, Ambien, Seconal, Nembutal)

_____ days

Erectile dysfunction (Viagra, Cialis, Levitra)

_____ days

Pain Relievers (OxyContin, Vicodin, Codeine, Dilaudid, Demerol, Darvon)

_____ days

Stimulants (Ritalin, Adderall, Concerta, Meridia, Methedrine, Benzedrine)

_____ days

Other prescription drugs (Please list: _____)

_____ days

19. Do you have a prescription for Adderall, Ritalin, or a similar drug used to treat Attention Deficient Disorder (ADD) or Attention Deficient Hyperactive Disorder (ADHD)?

_____ Yes

_____ No

20. How confident are you in your ability to administer Narcan®?

_____ I don't know what Narcan® is (If so, please skip to question 22)

_____ Not at all confident

_____ Unsure

_____ Somewhat Confident

_____ Confident

_____ Very Confident

21. Do you think the pharmacy on campus should provide Narcan®?

_____ Yes

_____ No

_____ Not Sure

22. Have you overdosed on opioids/heroin?

_____ Yes

_____ No

23. Do you know a UT student who has overdosed on opioids/heroin?

_____ Yes

_____ No

For the questions 24 through 29, please mark 'Yes', 'No', or 'Unsure'.

Other students' alcohol and/or drug use interferes with your experience on campus by:	Yes	No	Unsure
24. Interrupting your studying			
25. Making you feel unsafe			
26. Messing up your physical living space (e.g. cleanliness, neatness)			
27. Adversely affecting your involvement on an athletic team or other organized groups (e.g. club, fraternity)			
28. Preventing you from enjoying events (concerts, sports, social activities, etc.)			
29. Interfering in other ways (Please list) _____ _____ _____ _____			

*Note: An **energy drink** is defined as a caffeinated beverage, which is typically carbonated and may contain herbal supplements and amino acids. These beverages are marketed to stimulate the body mentally and physically. Examples include products such as Red Bull®, Monster®, Rock Star®, Amp®, 5-hour Energy®, Starbucks Refreshers®, Starbucks Doubleshot Energy® etc. This does not include beverages such as coffee, tea, or soda pop.*

30. For the following questions, please read each statement carefully and answer the questions under the assumption that you are an energy drink user, even if you have never had them. If you have never had an energy drink or alcohol, base your answers on what you have observed from others or what you have seen in the media (TV shows, movies, social media, etc.)

Please indicate whether you agree or disagree with the following statements:	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
a. I would experience withdrawal if I went without an energy drink(s).					
b. Energy drinks make me feel more alert.					
c. Energy drinks suppress feelings of hunger.					

Please indicate whether you agree or disagree with the following statements:	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
d. Having an energy drink makes me friendlier.					
e. Energy drinks make my workouts better.					
f. Having an energy drink makes me feel nervous.					
g. Having an energy drink late in the day disrupts my sleep.					
h. Energy drinks make me feel less drunk.					
i. I need to have an energy drink every day.					
j. Energy drinks increase my motivation to study.					
k. Energy drinks decrease my appetite.					
l. Conversations are better when I have an energy drink.					
m. I can exercise longer if I have an energy drink.					
n. I am easily stressed after having an energy drink.					
o. An energy drink late in the day gives me insomnia.					
p. Energy drinks mixed with alcohol taste better.					
q. I would get a headache if I went without having an energy drink(s).					
r. Energy drinks make me feel more energetic.					
s. Energy drinks allow me to skip meals.					
t. I feel more sociable after having an energy drink.					

Please indicate whether you agree or disagree with the following statements:	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
u. Energy drinks improve my athletic performance.					
v. Energy drinks make me jittery.					
w. I have difficulty sleeping after having an energy drink.					
x. Energy drinks help me to recover from a hangover.					
y. I often crave energy drinks.					
z. I feel less sleepy after having an energy drink.					
aa. Energy drinks help me avoid eating more than I should.					
bb. I feel more confident after having an energy drink.					
cc. I can exercise harder if I have an energy drink.					
dd. Even a small amount of an energy drink makes me anxious.					
ee. An energy drink at any time of day throws off my sleep.					
ff. Energy drinks allow me to drink more alcohol.					
gg. I would have difficulty starting my day without an energy drink.					
hh. Energy drinks help me work over long periods of time.					
ii. Energy drinks help me control my weight.					
jj. Energy drinks improve my mood.					
kk. I don't like the way energy drinks make me feel.					

Please indicate whether you agree or disagree with the following statements:	Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
11. Energy drinks help me party longer.					

Please check 'Yes' or 'No' to the following questions:	Yes	No
31. Have you ever consumed an energy drink? (If no, skip to question 41)		
32. Have you consumed an energy drink in the past 30 days?		
33. Have you consumed an energy drink in the past week?		

34. When you drink energy drinks, how many do you typically have?

_____ # of Energy Drinks

35. The last time you consumed energy drinks, how many did you have?

_____ # of Energy Drinks

36. In the past 30 days, how many energy drinks did you consume?

_____ # of Energy Drinks

37. On average, how many energy drinks do you have per day?

_____ # of Energy Drinks

38. What is the largest number of energy drinks you have consumed in a day?

_____ # of Energy Drinks

39. Why do you typically consume energy drinks? (Please check all that apply)

- _____ Addicted
- _____ Exercise harder
- _____ Exercise longer
- _____ Habit
- _____ Party
- _____ Pay attention in class
- _____ Study
- _____ Taste
- _____ Thirsty
- _____ To concentrate

- ☐ To wake up
☐ Don't Know
☐ Other: _____

40. How fast do you typically consume an energy drink?

- ☐ Less than 10 minutes
☐ Between 11 and 20 minutes
☐ Between 21 and 30 minutes
☐ More than 30 minutes

Please check 'Yes' or 'No' to the following questions:	Yes	No
41. Have you ever consumed an energy drink mixed with alcohol? (If no, skip to question 47)		
42. Have you consumed an energy drink mixed with alcohol in the past 30 days?		
43. Have you consumed an energy drink mixed with alcohol in the past week?		

44. How often do you have an energy drink while consuming alcohol (e.g., *5-hour Energy*® or other energy drink between drinking beers)?

- ☐ Never
☐ Rarely
☐ Sometimes
☐ Often
☐ Always

45. When you drink energy drinks mixed with alcohol, how many do you typically have?

_____ # of Energy Drinks mixed with Alcohol

46. What is the largest number of energy drinks mixed with alcohol you have consumed in a day?

_____ # of Energy Drinks mixed with Alcohol

47. Do you know the amount of caffeine that is in your energy drink of choice?

- ☐ I do not consume energy drinks
☐ Yes If yes, how many milligrams (mg) of caffeine? _____
☐ No
☐ Unsure

48. What size of energy drink do you typically consume?

- ☐ I do not consume energy drinks
☐ 2 oz.
☐ 8 oz.
☐ 12 oz.
☐ 16 oz.
☐ 24 oz.

☐ 32 oz.
☐ I don't know

49. What percentage of UT college students, do you think consume energy drinks?

(e.g., 20%) _____

50. Should universities sell energy drinks on campus?

☐ Yes ☐ No ☐ Not Sure

For the following questions, please mark the appropriate column for each row.

In the past 7 days, have you:	0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
51. Felt tired, dragged out, or sleepy during the day?								
52. Had an extremely hard time falling asleep?								
53. Woke up too early in the morning and couldn't get back to sleep?								
54. Gotten enough sleep, so that you felt rested when you woke up?								

55. Please rate how often you procrastinate, or wait until the last minute, to complete your work.

☐ Never
☐ Rarely
☐ Sometimes
☐ Very Often
☐ Always

56. Please rate how often you feel like you are behind with your work.

☐ Never
☐ Rarely
☐ Sometimes
☐ Very Often
☐ Always

57. How would you rate your time management skills?

☐ Very Poor
☐ Poor
☐ Fair
☐ Good
☐ Very Good

58. Do you consume other caffeinated beverages such as coffee, soda pop, or tea? *(Please check all that apply, and indicate the typical number of drinks per day)*

	No	Yes	If yes, how many drinks per day?
Coffee			
Soda Pop			
Tea			

The following section includes items pertaining to substance abuse issues, mental health issues, and academics:

59. Do you have a family history of addiction or alcoholism?

- ☐ Yes
☐ No
☐ Unsure

60. Are you currently experiencing any of the following: (Please check all that apply)

- ☐ ADHD (Attention-Deficit/Hyperactivity Disorder)
☐ Anxiety
☐ Bipolar Disorder
☐ Depression
☐ Intentional Self-Injury
☐ Psychotic Disorders/Schizophrenia
☐ N/A
☐ Other: _____

For questions, 61-65, please answer Yes, No, or Unsure to the following questions:

Due to a mental health issue(s) (Example, any of the items you checked in Question 60):	Yes	No	Unsure
61. I have received a lower grade on an exam or important project			
62. I have received a lower grade in one or more courses			
63. I have received an incomplete or dropped one or more courses			
64. I have missed a semester of school			
65. I have considered dropping out of school			

66. Do you have a faculty or staff member you could contact if you were experiencing difficulties with school or life in general?

- ☐ Yes
☐ No
☐ Unsure

67. During college, have you ever seriously considered suicide?

- ☐ Yes, in the last 12 months
☐ Yes, but not in the last 12 months
☐ Never

68. During college, have you ever attempted suicide?

- ☐ Yes, in the last 12 months
☐ Yes, but not in the last 12 months
☐ Never

The following questions address substance abuse and mental health issues on campus; please check the appropriate box for each item.

The following questions address substance abuse and mental health issues on campus. (Please check the appropriate box for each item)	Yes	No	Unsure
69. Do you believe there are adequate services provided by UT to prevent substance abuse issues?			
70. Do you believe there are adequate mental health services provided by UT?			
71. Do you know where to access substance abuse services at UT?			
72. Do you know where to access mental health services at UT?			

73. What suggestions do you have to address substance abuse issues among college students at UT?

74. What suggestions do you have to address the mental health issues among college students at UT?