A STUDY OF NCAA DIVISION I ATHLETES ON THE USE AND EFFECTS OF COMBINING ALCOHOL & ENERGY DRINKS

A Dissertation

presented to

the Faculty of the Graduate School

University of Missouri-Columbia

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

---

by

CONRAD WOOLSEY

Dr. Alex Waigandt, Dissertation Supervisor

AUGUST 2007

The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

A STUDY OF NCAA DIVISION I ATHLETES ON THE USE AND EFFECTS OF COMBINING ALCOHOL & ENERGY DRINKS

Presented by Conrad Woolsey

A candidate for the degree of Doctor of Education

And hereby certify that in their opinion it is worthy of acceptance.

Dr. Alex Waigandt

Dr. Niels C. Beck

Dr. Richard H. Cox

Dr. Richard T. McGuire

ACKNOWLEDGEMENTS

A special thanks to my Committee Chair, Dr. Alex Waigandt, for his positive support, timely help, and useful suggestions. Thank you to the rest of my Committee Members, Dr. Niels Beck, Dr. Richard H. Cox, and Dr. Richard McGuire for their help and flexibility. To all of the student athletes who participated in the study and athletic personnel who helped me, I owe a tremendous debt of gratitude. Thank you to my family and parents Dr. Wayne and Nancy Woolsey and brother Tucker Woolsey for their love and support throughout my life and college career. Finally, a very special thanks to my aunt and uncle Dr. Barb and Dr. Ron Woolsey for their advice, help and support throughout this project. Without all of you this would not have been possible.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

A STUDY OF NCAA DIVISION I ATHLETES
ON THE USE AND EFFECTS OF COMBINING
ALCOHOL & ENERGY DRINKS

Conrad Woolsey

Dr. Alex Waigandt, Dissertation Supervisor

ABSTRACT

The three main purposes of this study were (a) to determine the quantity-frequency rates of alcohol use, combined use (using an energy drink within plus or minus four hours of consuming alcohol), and energy drink use in a population of D-I athletes, (b) to compare reported risk taking behaviors and negative health consequences within combined users (*n* = 132), and (c) to investigate differences between men and women on reported risk taking behaviors. A total of 401 student athletes from a large Division-I university participated in the study. From the complete Quick Drink Screen (QDS) sample of 401 athletes, 315 or 78.55% used alcohol, 150 or 37.41% combined, and 194 or 48.62% used energy drinks within the past year. Results indicated that combined users consumed significantly more alcohol than athletes that used alcohol only. However, combined users consumed nearly double the amount of alcohol when they did not combine energy drinks with alcohol. Yet, results of the Brief Comprehensive Effects of Alcohol (B-CEOA) and Combined Use (B-CEOCU) expectancy measures still indicated that when athletes combined they took significantly more risks and experienced significantly more negative consequences. Results also indicated that men took significantly more risks than women while drinking alcohol only and combining.

A STUDY OF NCAA DIVISION I ATHLETES ON THE USE AND EFFECTS OF COMBINING ALCOHOL & ENERGY DRINKS

The concept behind combining stimulants with alcohol to reduce its depressant affects dates back many decades. In the past, people have combined caffeine, amphetamines, or other stimulants with the general idea that stimulants would antagonize the depressant effects of alcohol. Following the same concept, the new trend has been for people to use energy drinks. While the dangers of using energy drinks has recently been highly publicized in the news, currently no formal studies have been conducted on the combined use of alcohol and energy drinks in college students. According to reports by researchers, the use of energy drinks and combined use of energy drinks with alcohol has become increasingly popular in several countries (Ferreira et al., 2006, 2004a, 2004b, 2004c). In 2000, almost 1 billion cans of Red Bull® were sold in more then 100 countries, 260 million of them in the United Kingdom. In 2006, more than 3 billion cans were sold in more then 130 countries, clearly showing a dramatic increase in popularity (Wikipedia, 2007). Additionally, the energy drink market has recently exploded with several different brands of energy drinks which are also gaining popularity (Bauer & Smith, 2006). This increase is likely due to the increased accessibility and marketing of energy drinks in establishments that serve alcohol (Irmak et al., 2005; Shiv et al., 2005). With energy drink commercials touting, improved performance, enhanced stamina and mood, and “giving you wings” it is a possibility that several people have started to expect energy drinks to reduce the depressor effects of alcohol (Wikipedia, 2007). Furthermore, with many new energy drinks now containing higher levels of stimulants and energy drink sales increasing by roughly 80% in the last year, the health risks associated with using energy drinks could be higher than ever (Bauer & Smith, 2006). In 2004, a general supplement use survey conducted on student-athletes from a major division I university (N = 203), indicated that energy drinks were the most commonly used supplement by athletes (Froiland et al., 2004). However, to date, little research has been published on the consumption rates of energy drinks.

In the last few decades, there has been a close examination of college student alcohol use. Research indicates that the majority of college students consume alcohol, and a substantial percentage of those that drink are binge drinkers (The Core Institute, 1998; Wechsler et al., 1994). As a whole, college students have already been identified as an at risk population for problems associated with alcohol. Within this group of at-risk drinkers, athletes have been identified as the heaviest users and to be the most at-risk for serious problems associated with alcohol (Leichliter et al., 1998; Nelson & Wechsler, 2001; Wechsler et al., 1997). Previous researchers have revealed that college athletes are more likely to consume larger amounts alcohol and to drink more frequently than other college students (Nelson & Wechsler, 2001; Wechsler et al., 1997; Leichliter et al., 1998). In a national study conducted by Nelson & Wechsler (2001) results indicated that athletes have significantly higher rates of binge drinking than non-athletes. Research has shown that college athletes participate in more alcohol risk taking behaviors than other college students (Leichliter et al., 1998; Wechsler et al., 1994, 1995, 1997; Nattiv & Puffer, 1991). It has also been discovered that among college students, athletes experience a greater percentage of negative consequences from using alcohol (Leichliter et al., 1998, Wechsler et al., 1994, 1995). Wechsler, Davenport, Dowdall, Grossman, & Zanakos (1997) also discovered gender differences, with more male athletes reporting binge drinking than female athletes. Several studies have indicated that women generally consume less alcohol, engage in high-risk or “heavy episodic drinking episodes” less frequently, and experience fewer negative consequences than men on college campuses (Engs & Hanson, 1985; Presley et al., 1995, 1996a, 1996b; Wechsler et al., 1994).

While athlete alcohol consumption and risk taking behaviors have been highly researched, the quantity-frequency rates of the combined use of alcohol and energy drinks has not been studied. Additionally, athlete risk taking behaviors and negative consequences while combining alcohol and energy drinks has not been previously researched. Therefore, the 3 main purposes of the current study were to measure athlete combined usage rates, risk taking behaviors, and negative consequences while combining. Differences between men and women were also investigated.

In the review of literature section, prior research studies related to athlete alcohol and energy drink use are summarized. Nearly all of the current alcohol studies on athletes compare athletes to non-athletes. Therefore, the findings comparing these groups were presented. Previous research related to athlete risk taking behaviors and negative health consequences is also presented. Results of the studies that have been conducted on the combination of energy drinks and alcohol are also summarized. Lastly, relevant research on the instruments used in this study is also described. Additional details to the summarized studies within this literature review and the ingredients found within energy drinks are presented in the extended literature review section.

Since the inception of energy drinks, many athletes have used them with the belief that the ingredients contained within them could enhance their performance. If athletes believe that energy drinks alone will enhance their performance, then what do they think energy drinks will do for them when combined with alcohol? A general question of this investigation is: Do college athletes expect energy drinks to reduce the negative affects and improve the positive affects of alcohol? This investigation specifically examines athlete risk taking behaviors and negative consequences that result from using alcohol and energy drinks. This investigation was conducted to better understand the following questions: (a) Do athletes take more risks when they combine alcohol and energy drinks; (b) Do athletes suffer from more negative consequences when they combine; (c) Are there differences between men and women on risk taking behaviors associated with alcohol and combined use? To better understand these research questions, user expectancies of using alcohol were compared to when they combined alcohol and energy drinks.

Energy Drink Studies

Since its inception, in 1987, Red Bull® has been the most heavily marketed and sold energy drink (Wikipedia, 2007). Possibly for this reason, the main ingredients found within it have also been used in many of the energy drink research studies (Seidl et al., 2000; Warburton et al., 2001; Scholey & Kennedy, 2004a, 2004b; Deixelberger-Fritz et al., 2003; Ferreira et al., 2004a, 2004b, 2006). The ingredients within Red Bull® are sucrose, glucose, sodium citrate, taurine, glucuronolactone, caffeine, inositol, niacinamide, calciumpantothenate, pyridoxine HCL, Vitamin B12, natural and artificial flavors, and colors (Wikipedia, 2007). Many research studies have been conducted on the traditional main ingredients found within energy drinks (caffeine, taurine, and glucuronolactone), which supports energy drink manufacturers claims of increased performance, endurance, concentration, reaction time, and enhanced mood (Seidl et al., 2000; Warburton et al., 2001; Scholey & Kennedy 2004a, 2004b; Deixelberger-Fritz et al., 2003). Researchers have noted a synergistic affect when the individual ingredients within energy drinks are mixed together (Deixelberger-Fritz et al., 2003; Scholey & Kennedy, 2004a, 2004b; Ferreira et al., 2006). Results indicate that the whole energy drink results in significant improvements in "secondary memory" and "speed of attention" (Scholey & Kennedy, 2004a). Energy drink studies have also identified improvements in aerobic and anaerobic performance (Alford et al., 2001), sustained attention and reaction time (Deixelberger-Fritz et al., 2003; Alford et al., 2001; Warburton et al., 2001), improved mood and mental performance (Smit & Rogers, 2002; Deixelberger-Fritz et al., 2003), improved driving performance (Reyner & Horne, 2001, 2002) and alertness (Alford et al., 2001; Warburton et al., 2001; Reyner & Horne, 2001, 2002).

It has been found that user expectancies, or what one believes energy drinks will do for them, has a considerable effect on outcomes (Irmak et al., 2005; Shiv et al., 2005). However, there are several scientific reports concluding that energy drinks do improve physical and mental performance (Alford et al., 2001; Seidl et al., 2000; Smit and Rogers, 2002; Deixelberger-Fritz et al., 2003). In controlled studies with energy drinks alone, experiments have shown improvements in motor reaction time, concentration, short term memory, subjective sensation of alertness, and physical vigor (Alford et al., 2001; Seidl et al., 2000). Additional information explaining the methods and results of energy drink studies can be found in the extended literature review section.

Combined Use Studies

When energy drinks are combined with alcohol, combined users frequently report that energy drinks reduce the depressant effects of alcohol and increase its' stimulating effects (Ferreira et al., 2006). In the study, "*Can energy drinks affect the effects of alcoholic beverages? A study with users.*" Ferreira, Mello, & Souza-Formigoni (2004a) were the first to examine combined users perceived effects of energy drinks and alcohol. In their study, the sample consisted of 136 volunteers aged 24 ± 6 years, who had reported at least one previous use of energy drinks. Volunteers at drinking establishments answered a questionnaire on their pattern of use of energy drinks and alcoholic beverages. The majority of the sample (76%) reported combining energy drinks with alcohol. 79% of the sample also reported using energy drinks alone. Out of those who combined alcohol and energy drinks, 14% reported feeling no difference, 38% increase in happiness, 30% euphoria, 27% uninhibited behavior, 24% increase of physical vigor, and 11% experienced insomnia (Ferreira et al., 2004a, p. 51). The researchers found a high variability in the number of lifetime uses of energy drinks (14 ± 16), but there was a consistency in the number of cans ingested per occasion (1.5 ± 0.7). The researchers concluded that "the effects of energy drinks are variable, most likely depending on the dose used and individual sensitivity" (Ferreira et al., 2004a, p. 51).

Ferreira, Mello, Pompe´ia, & Souza-Formigoni (2006) continued research on the effects of energy drink consumption on alcohol. Their research study, "*Effects of energy drink ingestion on alcohol intoxication*" investigated whether energy drinks reduced the depressant effects of alcohol. Ferreira et al. (2006) used small doses of alcohol and energy drinks and measured participants breath alcohol concentration, subjective sensations of alcohol intoxication, objective effects on coordination, and visual reaction time (Ferreira et al., 2006, pp. 599-602). Results indicated a considerable difference between subjects' perceptions of what energy drinks would do for them compared to the objective measures of motor coordination and visual reaction time (Ferreira et al., 2006, pp. 600-602). Specifically, participants perceived that energy drinks reduced the depressant affects and increased the excitatory affects of alcohol, yet their physical performance remained unchanged. Suggesting that combined use reduces user sensations of tiredness and sleepiness, but actual capabilities on motor coordination and visual reaction time are still significantly impaired (Ferreira et al., 2006, pp. 600-602). It is important to examine the combined use of energy drinks and alcohol as it may lead to an increase in risk taking behaviors such as drinking and driving and increased alcohol consumption (Riesselmann et al., 1996; Ferreira et al., 2006). To date, little human scientific evidence exists on the complex interaction between the "whole energy drink" or all of the components found within energy drinks and alcohol (Ferreira et al., 2006, 2004a, 2004b).

Athlete Alcohol Consumption

Research indicates that college athletes are more likely to consume larger amounts of alcohol and to drink more frequently than other college students (Nelson & Wechsler, 2001; Wechsler et al., 1997; Leichliter et al., 1998). Several research studies have consistently shown that athletes exhibit higher rates of alcohol consumption and related consequences. Furthermore, several studies have indicated that college athletes report higher alcohol use and misuse than non-athletes (Hildebrand et al., 2001; Leichliter et al., 1998; Nelson & Wechsler, 2001; Wechsler et al., 1997). Hildebrand, Johnson, & Bogle et al. (2001) found that 28.5% of athletes compared to 13.8% of non-athletes reported drinking heavily. Leichliter, Meilman, Presley, & Cashin (1998) reported that college athletic team members consume roughly one-third more drinks per week (M = 9.66) than other college students (M = 6.37) not involved in sports. Student athletes also report more alcohol-related risk taking behaviors and consequences from activities such as drinking and driving and unsafe sexual practices (Leichliter et al., 1998).

A study conducted by the National Collegiate Athletic Association (2001) showed that 78.3% of college athletes had used alcohol within the previous year. A similar NCAA study (N = 13, 914) by Green, Uryasz, Petr, & Bray (2001) reported that 80.5% of surveyed student athletes consumed alcohol within the past year. In another national study conducted by Nelson & Wechsler (2001), athletes reported significantly higher rates of binge drinking than non-athletes. Their findings indicated that 49% of men not competing in intercollegiate athletics reported binge drinking in the 2 weeks prior to the survey compared to 57% of the male athletes. Similarly, 40% of female non-athlete students reported binging, compared to 48% of female athletes (Nelson & Wechsler, 2001). Male and female athletes have also been shown to be significantly more likely to use larger amounts alcohol and to binge more often than those not involved in athletics (Wechsler et al., 1997). Wechsler, Davenport, Dowdall, Grossman, & Zanakos (1997) also discovered gender differences, with more male athletes reporting binge drinking than female athletes. Refer to the extended literature review section for additional information on these studies.

Athlete Energy Drink Consumption

Very little energy drink consumption quantity-frequency research has been conducted. Currently, two studies have examined the amount of use of energy drinks, with one pertaining to athletes (Ferreira et al., 2004a, Froiland et al., 2004). In 2004, a general supplement use survey conducted on student-athletes from a major division I university, showed that energy drinks were the most commonly used supplement by these athletes (Froiland et al., 2004). From a total sample of 115 men and 88 women (*N* = 203), nearly 73% reported using energy drinks as a nutritional supplement. However, in this study, the researcher also included Gatorade®, Powerade®, and All-Sport® along with Red Bull®. Therefore, this finding is potentially of low significance since it would be expected that most athletes would use these electrolyte replacement drinks.

Athlete Risk Taking Behaviors

A number of studies have focused on risk taking behaviors among college athletes. Risk taking behaviors are any attitude or behavior that potentially endangers a person's physical health, safety, or life (Bunsen, 1991; Clark et al., 1990). Numerous research studies have indicated that college athletes participate in more alcohol risk taking behaviors when compared to other college students (Leichliter et al., 1998; Wechsler et al., 1994, 1995, 1997; Nattiv & Puffer, 1991). In a comparative risk taking study of athletes versus non-athlete controls, Nattiv & Puffer (1991) found that athletes engaged in more high risk lifestyle behaviors. Some of these behaviors included: higher alcohol consumption, more frequently driving while intoxicated, more frequently riding with a driver who is intoxicated, less use of contraception, higher incidence of sexually transmitted disease, more sexual partners, and more health problems.

Previous research has shown that college athletes are predisposed to have high risk taking personalities (Benjamin et al., 1996; Nattiv & Puffer, 1991; Zuckerman, 1983, 1996). Athletes have been classified as a group of individuals with novelty-seeking personalities, which has been defined as “having risk-taking traits involving driving habits, behaviors, gambling, financial activities, alcohol and drug use as well as sports” (Benjamin et al., 1996, p. 81). A number of common personality characteristics have been cited to be associated with both college athletic participation and involvement in risk taking behaviors. Some of these characteristics include high levels of sensation seeking, extraversion, and a learned bias to expect optimistic outcomes (Zuckerman, 1971; Kerr, 1991a; Jackson & Mathews, 1988; Kane, 1971). Previous research has suggested a high correlation between sensation seeking and risky sexual behavior (Horvath & Zuckerman, 1993) and risky driving behavior (McMillian et al., 1989). Along these lines of research, college athletes have been shown to be more likely than other college students to participate in risky sexual behaviors and to drive under the influence of alcohol (Nattiv & Puffer, 1991; Leichliter et al., 1998). For example, in the Leichliter et al. (1998) survey, 42.6% of team leaders and 36.9% of team members, reported driving under the influence of alcohol, compared to 30.4% of non-athletes. Results of studies on drinking and sexual behavior have shown that men and women differ in their beliefs about the effects of alcohol on sexual responding (Leigh, 1990; Mongeau & Johnson, 1995). Expectations of sexual enhancement and disinhibition were related to the initiation of sexual activity, number of sexual encounters that took place while drinking, and the amount of alcohol consumed (Leigh, 1990). In previous B-CEOA expectancy research, there has been a trend for greater expectancies related to enhanced sexuality from drinking to be related to greater alcohol related problems (Ham et al., 2005).

Extraversion is another personality characteristic that has been linked to athletes and increased levels of risk taking behavior. Extraversion has been defined as, “the act, state, or habit of being predominantly concerned with and obtaining gratification from what is outside of the self" (Merriam-Webster, 2007). It is particularly important to note that extraversion has been linked with the increased use of alcohol and stimulants (Jackson & Mathews, 1988; Kane, 1971).

Negative Consequences

Research indicates that among college students, athletes experience a greater percentage of negative consequences from using alcohol (Leichliter et al., 1998; Wechsler et al., 1994, 1995). In the Leichliter et al. (1998) sample of 51,483 students from 125 U.S. colleges, results indicated significant differences among the groups for 18 out of 19 negative consequences experienced in the past year from alcohol use. Of this sample for every consequence except one "thought about suicide", team leaders reported the most consequences and team members were more likely to experience consequences than non-athletes**.** Following a trend, as athletic involvement increased, the results indicated an increase in the percentage of consequences experienced including athletes being hurt or injured as a result of drinking alcohol (Leichliter et al., 1998). Additionally, 17.5% of team leaders and 16.6% of team members reported being taken advantage of sexually, compared to nearly 10% of non-athletes.

Among college students, research has indicated that drinking motives are significantly associated with experiencing negative alcohol-related consequences (Carey & Correia, 1997; Kassel et al., 2000; Lecci et al., 2002). Within intercollegiate athletes, drinking motives were found to be useful predictors of negative alcohol-related consequences (Martens et al., 2003). Findings by Martens, Cox, & Beck (2003) suggested that athletes "drinking for negatively reinforcing reasons (i.e., coping motives) is generally the strongest motivational predictor of alcohol-related consequences," while social and enhancement motives can also be strong predictors (p. 825).

Expectancy Instrument Research

Alcohol outcome expectancies refer to the beliefs that people hold about the effects of consuming alcohol (Brown et al., 1980). These expectancies are thought to influence and help predict drinking behavior (Ham et al., 2005). Several studies support the relationship between expectancies and problematic drinking behavior (Brown, 1985; Martin & Hoffman, 1993; Reis & Riley, 2000; Wood et al., 1992). Expectancies are important in understanding drinking behavior, and can provide direction for problem drinking prevention and intervention (Ham et al., 2005).

According to Dimeff, Baer, Kivlahan, & Marlatt (1999) the original 38-item CEOA has been found to be a sound and comprehensive measure, but its administration time can be too lengthy for clinical purposes. Because of the limited time allotted for a college alcohol intervention program called the Alcohol Skills Training Program (ASTP), a shorter version of the CEOA called the Brief Comprehensive Effects of Alcohol (B-CEOA) was developed (Addictive Behaviors Research Center, 1997). The B-CEOA contains a subset of 15 items which measure expectancies and valuations from the original CEOA (Ham, et al., 2005). The use of the B-CEOA has been supported by studies at Dalhousie University (N = 581) and University of Nebraska-Lincoln (N = 734), in which comparisons were made among the psychometric properties of the original CEOA and the B-CEOA (Ham et al., 2005). Results of these studies, which will be discussed in greater detail in the methods section to follow, show empirical validity for the use of the B-CEOA, as an effective alcohol measure. To date, no studies have addressed college student-athlete expectancies of the combined use of alcohol and energy drinks. The current study is the first to compare athlete’s expectancies of using alcohol only to combining alcohol with energy drinks.

Statement of the Problem

In previous research, users have reported that energy drinks reduce the negative affects and increase the stimulating effects of alcohol (Ferreira et al., 2006). By researching how widespread this belief is one can determine how energy drinks may be leading to increased risk taking behaviors and negative health consequences in college athletes. By investigating athlete’s expectations of combined use it will help determine why athletes are using this combination. This research could help protect future athletes from experiencing the negative consequences of using energy drinks and alcohol. By better understanding athletes’ expectancies of using energy drinks and alcohol, we may be able to help athletes more effectively.

Little human subject research has been conducted on the combined use of energy drinks and alcohol. No previous combined use quantity-frequency research has been conducted on athletes. Additionally, the current study was the first to compare athlete’s expectancies of using alcohol to the combined use of energy drinks and alcohol. In this study, combined use was defined as using an energy drink within plus or minus four hours of consuming alcohol. This time period was determined by examining results from previous energy drink studies, which showed that the effects of energy drinks continue for several hours after they are consumed (Ferreira et al., 2006; Scholey & Kennedy, 2004b; Liguori & Robinson, 2001). The synergistic affects of the ingredients within energy drinks and the half life of caffeine (4-6 hours) were also considered (Graham, 2001).

The energy drink market has recently exploded with several different brands of energy drinks. With the availability increasing and several energy drinks becoming more powerful, the health risks associated with using energy drinks is potentially greater than ever. Since previous researchers have suggested that the combination of energy drinks and alcohol is dangerous (Ferreira et al., 2006), and athletes have been shown to be likely to drink both of these substances (Froiland et al., 2004; Leichliter et al., 1998), there is clearly a need for this study. Contributions from this study may help protect future athletes and other individuals that consume energy drinks with alcohol.

Purpose of the Study

The first purpose of the study is to determine the quantity-frequency rates of alcohol use, combined use, and energy drink use in a population of D-I athletes. Athletes were chosen for this study because they are already considered to be an at risk population for drinking alcohol and using energy drinks. The second purpose of the study is to compare reported risk taking behaviors and negative health consequences within subjects that use alcohol by itself and combine energy drinks with alcohol on separate occasions. By using within subjects comparisons between the alcohol (B-CEOA) and combined use (B-CEOCU) expectancy measures, possible differences in reported risk taking behaviors and negative health consequences were investigated. The third purpose of the study was to investigate possible differences between men and women on reported risk taking behaviors with alcohol use and combined use.

The instruments of this study were designed to specifically answer the research questions. The Quick Drink Screen (QDS) measures were designed to determine the quantity-frequency rates of alcohol, combined use, and energy drink use. The QDS instruments were also used to determine which athletes use both alcohol and combine energy drinks with alcohol on separate occasions. Once this group was determined by using the QDS quantity-frequency measures, comparisons were made between these athletes' reported risk taking behaviors and negative health consequences on the alcohol (B-CEOA) and combined use (B-CEOCU) expectancy measures. The expectancy measures of the study were created to measure differences in risk taking behaviors and negative health consequences within the same user. Separate comparisons were also made between men and women on alcohol risk taking behaviors (n = 281) and combined use risk taking behaviors (n = 131).

The research questions of this study were: 1) What are the quantity-frequency rates of alcohol, combined use, and energy drinks in a population of D-I athletes? 2) In athletes that use both alcohol and combine, is there a significant difference in reported risk taking behaviors? 3) In athletes that use both alcohol and combine, is there a significant difference in reported negative health consequences? 4) Is there a significant difference between men and women on alcohol risk taking? 5) Is there a significant difference between men and women on combined use risk taking?

Hypothesis 1

Within combined users (those that use alcohol by itself and combine) there will be significant differences in reported risk taking behaviors when they use alcohol by itself compared to when they combine alcohol and energy drinks.

Hypothesis 2

Within combined users, there will be significant differences in reported negative consequences when they drink alcohol by itself compared to when they combine alcohol and energy drinks.

Hypothesis 3

There will be significant differences in reported risk taking behaviors between men and women on alcohol use.

Hypothesis 4
There will be significant differences in reported risk taking behaviors between men and women on combined use.

Method

The Method Chapter consists of four subsections. In the participants section characteristics of the sample and how they were obtained are described. Descriptions of the measures and their psychometric properties are discussed in the instruments section. The instruments included in this section are revised versions of the Quick Drinking Screen (QDS) and the Brief Comprehensive Effects of Alcohol (B-CEOA). Both instruments were originally created to measure alcohol use only. Therefore, to meet the purposes of this study, slight modifications were made to both instruments to appropriately measure combined use within subjects. Lastly, the statistical techniques are discussed in the data analysis section.

Participants

The participants in this study were 257 male and 144 female NCAA student-athletes, mainly consisting of eighteen to twenty three year olds from a large Midwestern Division-I university. The total sample consisted of 401 student-athletes from every men's and women's NCAA sport offered by the university including: football, golf, gymnastics, baseball, basketball, soccer, softball, swimming and diving, track and field, tennis, wrestling, volleyball. Table 1 shows the distribution by gender and sport for the total sample and quantity-frequency measures; Tables 2 and 3 show the distribution by gender and sport for the research hypotheses. This population of student-athletes was asked to voluntarily participate in the study during organized team meetings. The researcher met with each team individually and scheduled meeting times with coaches and athletic department academic coordinators. All participants were treated ethically and fairly according to APA guidelines and the campus Institutional Review Board.

Instruments

Quick Drinking Screen. The Quick Drinking Screen (QDS) is a quantity-frequency and daily estimation measure that provides a retrospective estimate of a person's average alcohol consumption. The QDS contains a total of five items and participants answer four questions about their average alcohol use. The fifth item (Drinks per week in past year) is figured by the researcher by multiplying the participant's answers to questions 1 (days drinking per week) and 2 (number of drinks per day). The Quick Drink Screen was chosen for this investigation for three main reasons. First, it shows high reliability and consistency rates similar to that of the Timeline Followback (TLFB) measure (Sobell et al., 2003). Second, the QDS takes 3-5 minutes to administer versus 20-30 minutes for the TLFB. In turn, allowing the primary researcher to reliably measure the quantity-frequency rates of alcohol, combined use, and energy drinks over an entire year. Since athlete drinking patterns typically vary during different times of the year, depending on training, practice, and competition schedules, the time period of one year was chosen to not miss athletes' sporadic drinking patterns and times of increased consumption such as Spring Break. Since some athletes may go months without consuming alcohol, it was important to measure alcohol and energy drink consumption over an entire year.

The most well known daily estimation method for alcohol use is the Timeline Followback (TLFB) method. However, many researchers have noted that the main problem with using the TLFB is that it takes 20-30 minutes to administer, making it impractical when there are time constraints (Miller & Del Boca, 1994; Sobell et al., 2003; Sobell & Sobell, 2003). To remedy this problem, the Quick Drink Screen (QDS) was developed to reliably assess alcohol consumption in a consistent and timely manner (Sobell et al., 2003; Sobell & Sobell, 2003). In a study (*N* = 825) to determine the construct validity of the QDS, Sobell, Agrawal, Sobell, Leo, Young, Cunningham, & Simco (2003) compared the Quick Drink Screen to the previously established Timeline Followback method. Supporting the use of the Quick Drink Screen, results showed remarkably similar aggregate alcohol use data between the two instruments (Sobell et al., 2003, Sobell & Sobell, 2003). In this study, results from the QDS were strikingly similar and consistent with results from the TLFB method on the 5 variables measured (Sobell et al., 2003, p. 860). When compared to the TLFB method the QDS measure demonstrated good internal consistency and reliability as alpha coefficients for the variables, days drinking per week, drinks per week, and drinks per day in the past year were reported as .82, .74, and .68 respectively (Sobell et al., 2003, p. 860). Furthermore, all of the intraclass correlations were shown to be significant (p < .001). More impressive than the results of the statistical tests was the close relationship between the means and standard deviations of the drinking variables (Sobell et al., 2003, p. 860). Additionally, the agreement between the two measures was not indicated to be related to repetitive response patterns (Sobell et al., 2003).

There is no known quantity-frequency measure for energy drinks or combined use. Therefore, for the purposes of the current investigation, the language of the Quick Drink Screen instruments were modified to make the item stems consistent with the variables being measured. To accurately measure the combined use of alcohol and energy drinks and energy drinks only it was necessary to slightly modify the original instrument. Examples of the QDS instruments are shown in the Appendix.

Brief Comprehensive Effects of Alcohol (B-CEOA). The B-CEOA was developed by the University of Washington research group for use in their ASTP brief college alcohol intervention (Addictive Behaviors Research Center, 1997). The original 38-item Comprehensive Effects of Alcohol (CEOA) is a sound and comprehensive measure (Fromme et al., 1993). However, it can be too lengthy for clinical purposes or when other instruments are used (Dimeff et al., 1999; Ham et al., 2005). To remedy this problem, the Brief Comprehensive Effects of Alcohol (B-CEOA) was created. The B-CEOA contains a subset of 15 items which measure expectancies and valuations from the original CEOA (Ham, et al., 2005). The use of the B-CEOA has been supported by studies at Dalhousie University (*N* = 581) and University of Nebraska-Lincoln (*N* = 734) in which comparisons were made between the psychometric properties of the original CEOA and the B-CEOA (Ham et al., 2005).

In the Dalhousie University study, the convergence between the factor structures using exploratory statistics provides support for the four-factor structure of alcohol expectancies and the three-factor structure of alcohol valuations for the B-CEOA (Ham et al., 2005). When comparing the CEOA to the B-CEOA the internal consistencies and alpha's were similar using both models. The internal consistencies for the full-scale CEOA and the B-CEOA were comparable ranging from .66 to .84 for the CEOA and .60 to .81 for the B-CEOA (Ham et al., 2005). Conversely for the valuation factors, internal consistencies ranged from .70 to .86 for the CEOA and .61 to .81 for the B-CEOA (Ham et al., 2004).

For the purposes of measuring combined use risk taking and negative consequences, the 27-item B-CEOA and B-CEOCU were used to assess athlete's expectancies when using alcohol and combining. Participants followed the original B-CEOA instructions while answering the 27-item B-CEOA and Brief Comprehensive Effects of Combined Use (B-CEOCU). Participants indicated their expectancies or "degree of agreement" that a particular effect will happen to them if they were under the influence of alcohol or combined use on a 1-4 scale ranging from 1 = disagree to 4 = agree. Additionally, participants indicate whether an effect would be desirable or undesirable to them on a second 1-4 scale ranging from bad =1 to good = 4 (Ham et al., 2005). Each measure was administered on a separate page and the wording was changed from alcohol use to combined use for the B-CEOCU while otherwise keeping the same format. To avoid confusion, participants answered for alcohol use first and then combined use. Varying the order of administration was considered, but it was not changed because it was thought that it would confuse the athletes. To avoid potential problems athletes were briefed that they would be answering the same questions for alcohol and combined use.

Since the original 15 item B-CEOA was created to measure alcohol expectancies only, a considerable amount of time and collaboration went into adding 12 additional questions to appropriately measure risk taking behaviors and negative consequences of combined use. This made the Brief Comprehensive Effects of Combined Use (B-CEOCU) a total of 27 items, with the original 15 item B-CEOA being left completely in tact. Athlete's expectancies while using alcohol and combining were compared using paired samples t-tests to investigate possible differences in risk taking behaviors and negative consequences within subjects. Comparisons between the alcohol (B-CEOA) and combined use (B-CEOCU) measures were made on 10 selected risk taking behaviors and 10 selected negative health consequences between the athletes that used alcohol and combined alcohol with energy drinks. The other items were used to check the consistency and validity of respondents answers. The selected items for the risk taking and negative health consequences scales are shown in Figures 1 and 2. The complete B-CEOA and B-CEOCU measures that were used in the study are displayed in the Appendix.

Procedure

Prior to the investigation, the researcher obtained permission and approval from the campus Institutional Review Board, athletic department's director of compliance, team coaches, and academic coordinators. Team meeting times were scheduled with team coaches or academic coordinators for each individual team. Participants were recruited as entire teams at a designated time established by that teams coach or academic coordinator. These voluntary meetings took place in designated meeting rooms or appropriate locations before or after team practice. In late August, a pilot for the study was conducted on the football team, in which it was determined that the survey needed to be shortened for better results. Originally, the study contained a separate measure for negative consequences. After making changes, the football team was re-tested with the shortened instrument in February, 2007 approximately 6 months after the pilot study was conducted. Graduating seniors did not take the survey twice, but were replaced by transfer students and incoming freshman. For men's and women's basketball, data was collected together at the end of a designated team study hall session. Very few of these participants were used because of potential problems with the data collection.

In sports where coaches have men and women athletes, data were collected together on both of the men's and women's teams. Prior to data collection a copy of the project description, describing the voluntary study and each participant's rights, was given and presented to each athlete. Prior to the administration of the study, the coaches and all athletic administrative personnel were asked to leave the area to protect the privacy of the athletes. It was stressed to the student-athletes that their participation in the research project was completely voluntary and that there would be no consequences if they chose not to participate. Athletes were assured that the information would be confidential and not used in any way to make evaluative decisions about them. Participants were asked to sit at least one seat apart to help maintain anonymity among participant answers. Due to the size of the football team, the researcher was unable to have every football participant sit one seat apart. After the initial introduction, the survey packet took approximately 20 minutes to complete.

Athletes were given a six page packet containing demographic information, the alcohol, combined use, and energy drink QDS quantity-frequency measures, and both 27-item alcohol (B-CEOA) and combined use (B-CEOCU) expectancy measures. At this time, the researcher went through the packet with the athletes to describe the directions for each instrument and answered any questions prior to beginning the survey. The researcher made special note to clearly define what is considered one alcoholic drink (12 oz. of beer, 1.5 oz. of 80 proof liquor, 4-5 oz. of wine), what specifically is to be considered an energy drink (Red Bull®, Rockstar®, Monster®, Full-Throtle®, Amp®, SoBe®, and others), and what is considered to be one energy drink (8 oz. of drink containing caffeine, taurine, and B-vitamins). There was a clear distinction made that an energy drink is a drink that is high in caffeine, taurine, and B-vitamins, and participants were specifically told that coffee was not be included. To help ensure honesty of respondent's answers, all participants were asked to fill out the entire instrument regardless of if they had used alcohol or energy drinks in the last year. Data for each instrument was collected in the same order throughout the study. Reversing the order of the instruments was considered, but it was determined that this could potentially confuse to the participants. Athletes were briefed that they would be answering the same questions for alcohol and combined use.

The first purpose of the study was to determine quantity-frequency rates of alcohol, combined use, and energy drink use in a population of D-I athletes. Each participant, filled out quantity-frequency information for alcohol only, combined use, and energy drink only use in that specific order. Combined use was considered as using an energy drink within four hours before or after consuming alcohol. The order of administering the Quick Drink Screen (QDS) instruments was carefully considered. ‘Energy drink only’ use was measured last to prevent participants from being confused about the definition of combined use. After the quantity-frequency measures were completed, each participant filled out the alcohol only B-CEOA and combined use B-CEOCU expectancy measures, regardless of if they had or had not used the substances.

The second purpose of study was to compare reported risk taking behaviors and negative health consequences within subjects that use alcohol by itself and combined alcohol with energy drinks on separate occasions. The alcohol and combined use Quick Drink Screen quantity-frequency measures were used to determine the groups of athletes used to answer the hypotheses of the study. To increase the viability of the study, the data from participants that reported not using in the past year or using just alcohol were separated from the ‘combined use’ sample (*n* = 132). To test hypotheses 1 and 2, comparisons were made between the B-CEOA and B-CEOCU expectancy measures on 10 selected risk taking and negative health consequences variables, which are shown in Figure 1. The ‘total alcohol use sample’ (*n* = 281) was used to answer hypotheses 3 which compared the alcohol risk taking behaviors of men and women that had used alcohol in the past year.

To calculate risk taking and negative health consequences, a numerical score of 1-4 was given to each expectancy question (1 = Disagree, 2 = Slightly Disagree, 3 = Slightly Agree, 4 = Agree) The risk taking behavior variable contains 10 items for a total of 40 possible points, with higher scores indicating more risk taking. The negative health consequences variable also contains 10 items for a total of 40 points, with higher scores indicating more negative health consequences. The selected items for the independent variables of risk taking and negative health consequences are shown in Figures 1 and 2. Other test items such as “I would feel peaceful” and “I would act aggressively” were used to screen the data.

Data Analysis

Descriptive statistics were used to report quantity-frequency information for the alcohol, combined use, and energy drink Quick Drink Screen (QDS) measures. The QDS measures were used to calculate each athlete’s average drinks per week in the past year, number of binge drinking episodes, and the greatest number of drinks in one day for alcohol, combined use, and energy drinks. Total scores for each quantity-frequency question were calculated and reported.

To test hypotheses one and two on combined users, paired samples t-test were used to compare mean differences in reported risk taking behaviors and negative health consequences within subjects that use both alcohol by itself and combined alcohol with energy drinks. To increase the viability of the study, the expectancy data from those not using in the past year or using alcohol only were separated from the sample and reported in the descriptive statistics. Total scores from the 10 selected risk taking items and 10 selected negative health consequences items were used to address the research questions. Higher scores indicate more risk taking behavior or more negative health consequences. To test hypothesis three, an independent samples t-test was used to compare the mean score of men and women on the alcohol expectancy questionnaire (B-CEOA). For this hypothesis, one item from the original risk taking scale was removed (I would sober up quicker) and replaced with "I would be loud, boisterous, or noisy" (see Figure 2).

To test hypothesis four, an independent samples t-test was used to compare the mean score of men and women on the alcohol (B-CEOA) and combined use expectancy measures (B-CEOCU). The Brief Comprehensive Effects of Alcohol (B-CEOA) and Brief Comprehensive Effects of Combined Use (B-CEOCU) data were entered into the Statistical Package for Social Sciences (SPSS) for analyses.

Results

This results chapter details and summarizes the statistical analyses utilized to quantify the research questions and hypotheses of the study. Initially, results of the data screening process will be reported for each of the data sets used to answer the research questions followed by the results from descriptive analyses. Subsequently, results of the Brief Comprehensive Effects of Alcohol (B-CEOA) and Brief Comprehensive Effects of Combined Use (B-CEOCU) expectancy measures, which were used to answer the 4 hypotheses, are detailed.

First, the descriptive statistics for the full sample (N = 401) Quick Drink Screen (QDS) quantity frequency measures on alcohol, combined use, and energy drinks were reported. Due to the nature of the data collected, several non-user participants did not completely fill out the second part of the survey, but their QDS information was still viable. The complete data set was used to determine the overall amount of alcohol use, combined use, and energy drink use among athletes. Sixty-two participants were removed from the complete data set due to incomplete data on the expectancy measures, which resulted in a total of 341 alcohol, combined, and non-user athletes. To answer the research hypotheses, the athletes that used alcohol and combined alcohol with energy drinks were split into two separate data sets. Therefore, the descriptive statistics for the combined users (n = 132) and total alcohol users (n = 281) were described. Finally, the results of the 4 research hypotheses comparing risk taking and negative consequences were reported.

Data Screening

Prior to analysis, the data were screened for accuracy of data entry, missing values, and normality. First, the descriptive statistics are reported for the complete sample of athletes on the alcohol, combined use, and energy drink Quick Drink Screen (QDS) measures. From a sample of 403 a total of 2 cases were removed for missing or corrupted data for descriptive analyses on the initial QDS quantity-frequency measures. An inspection of the QDS quantity frequency data revealed a trend for participants to answer 0 on question 1 (average days/week) of the QDS measures if they drank less than 1 day per week. Some participants indicated and/or calculated the exact number of how many times in the past year that they consumed alcohol. If the participant wrote down the number of times drinking in one year, the researcher calculated the number that they indicated and divided it by 52 (weeks/year) to calculate the days/week variable. Some participants reported using 0 days/week, and did not indicate the number of times drinking, but did indicate average number of drinks, binge drinking episodes, and other useful information. Therefore, the rest of their data were still included and SPSS was programmed to not include those participants in the average days/week calculation.

Descriptive Analyses

The complete QDS sample which includes non-users (*N* = 401) is described here in terms of relevant characteristics. The data consisted of 257 men and 144 women with an average age of 19.80 (*SD* = 1.31) years, with the top possible age being reported as 23+ years of age. 315 or 78.55% of athletes reported using alcohol within the past year, with 290 or 72.32% of athletes reporting binge drinking in the past year. Of athletes that consumed alcohol (*n* = 315) 290 or roughly 92% reported binge drinking in the past year, with binge drinking being defined as 5 or more drinks on one occasion for both men and women. 165 athletes (41.15%) reported using alcohol and not combining alcohol with energy drinks, 150 athletes (37.41%) reported combining alcohol with energy drinks, and 86 athletes (21.45%) reported not using alcohol or combining. On the energy drink only QDS instrument (n =399), 194 or 48.62% of athletes reported using energy drinks without alcohol. From the Brief Comprehensive Effects of Combined Use (B-CEOCU) sample (*n* = 132), 78.79% or 104 combined users reported using energy drinks without alcohol.

From the initial sample of 403 athletes a total of 62 cases were removed for the analyses on the B-CEOA and B-CEOCU expectancy measures for a total sample of 341 athletes. An inspection of the data revealed some patterns in missing or corrupted data. If participants reported not using alcohol or combining alcohol with energy drinks they were more likely to not completely fill out the expectancy part of the questionnaire. Even though, all of the participants were asked to fill out the entire instrument, it was common for those that only used alcohol to write “I do not use energy drinks” on the second page of questions or to just fill in the blanks in one column without reading the questions.

There was also a similar trend in the way that users rated their valuations (good-bad) of either alcohol or combined use. Respondents took more time reading and answering about their expectancies (agree-disagree) leaving this data in a usable manner. The data for the valuations was not very good with several participants just marking bad all the way down without reading the questions. As a result, 62 cases were removed for missing or corrupted data from the data set that was used to answer the research hypotheses. It was suspected that the reason for this was the amount of time and thought that it takes to answer these questions. If the respondent did not use alcohol, they were more likely to not take the time to answer the questions seriously. Since non-users were likely to not fill out the expectancy measures, yet their data is still relevant for the quantity-frequency measures, their data were still reported. To remedy the potential problems with the data, only the athletes that used alcohol or combined alcohol with energy drinks were included in the research hypotheses.

Due to the number of cases removed, the screened sample is described here in terms of relevant characteristics. The sample consisted of 149 athletes (78 men, 71 women) that had used only alcohol in the past year and 132 athletes that had combined alcohol with energy drinks (91 men = 68.9%, and 41women = 31.1%), and 60 athletes that used neither or very small amounts of alcohol (two or less drinks total in the past year). Six participants were removed from the alcohol group and put into the neither group because they reported using only one or two alcoholic drinks total within the past year (with only one or less per occasion), which were deemed to not be enough to accurately tell differences on the alcohol expectancy measure.

To answer the 4 research hypotheses the data were separated into two data sets. First, a combined use data set (*n* = 131) for athletes that used both alcohol by itself and combined alcohol with energy drinks. The descriptive statistics for the combined use sample QDS instruments are shown in Tables 4 and 5. Second, a total alcohol use data set (*n* = 281) of all the athletes that had used alcohol in the past year. The descriptive statistics for the alcohol only QDS variables are shown in Table 6.

Hypotheses 1, 2, and 4 compared risk taking and negative consequence expectancies of the participants that had combined alcohol with energy drinks (combined users) in the past year. The combined use sample contained 91 men (68.9%) and 41 women (31.1%) with an average age of 20.0 (SD = 1.30) years. The majority of the sample was of Caucasian descent (*n* = 115, 87.1%) with individuals of African-American (*n* = 11, 8.3%), Asian-American (*n* = 3, 1.6%), Latino/Latina (*n* = 2, 1.0%), and biracial/multiracial (*n* = 2, 1.5%) descents comprising the remainder of the sample. The combined use sample consisted of 24 freshman, 39 sophomore, 34 junior, and 35 senior or graduate student-athletes, with 62 athletes from team sports and 70 athletes from individual sports.

When using alcohol by itself, combined users (both men and women together) reported using alcohol an average of 1.76 days per week (*SD* = .95), and consuming an average of 8.60 (*SD* = 5.14) alcoholic drinks per occasion. While combining, these same athletes reported using energy drinks with alcohol an average of .85 days per week (*SD* = .83), and consuming an average of 6.28 (SD = 4.41) alcoholic drinks per occasion. Furthermore, while consuming alcohol by itself combined users greatest number of alcoholic drinks on one occasion was an average of 18.23 (*SD* = 10.56) as compared to

10.83 (*SD* = 7.94) when combining. Therefore, athletes consumed considerably more alcohol when they used alcohol only. On average, athletes reported significantly less alcohol use on all of the quantity-frequency variables while combining ($p < .001$).

Within the combined users, 81 athletes reported participating in the high risk taking behavior of consuming 3 or more energy drinks with alcohol (combined energy drink binge), with the average number of binge drinking episodes of 8.21 (*SD* = 16.5) times in the past year with the non-binge drinkers included. Without using alcohol considerably fewer participants ($n = 26$) reported having 3 or more energy drinks on one occasion, with the average number of energy drink only binging episodes being 2.69 (*SD* = 8.83) times in the past year. When using alcohol, athletes reported using an average of 2.17 energy drinks per occasion (*SD* = 2.18) compared to .90 energy drinks (*SD* = .87) per occasion without alcohol. Therefore, combined users consumed considerably more energy drinks when using alcohol. The average number of energy drinks without alcohol was below 1 because 47 combined users reported that they had not used an energy drink without alcohol in the past year.

In combined users, significant differences were present between males and females on the average amount of alcohol consumed while drinking alcohol only, $t(126) = 7.33$, $p < .001$ and combining, $t(122) = 5.32$, $p < .001$. Males consumed an average of 10.12 alcoholic drinks (*SD* = 5.33) per occasion when drinking alcohol by itself compared to an average of 7.31 alcoholic drinks (*SD* = 4.75) while combining alcohol with energy drinks. Whereas, females consumed an average of 5.17 drinks (*SD* = 2.28) when drinking alcohol by itself compared to 3.91 drinks (*SD* = 2.23) while combining. Therefore, men consumed considerably more alcohol than women under both circumstances. Significant differences were also present between males and females on the average amount of energy drinks consumed while drinking energy drinks only, *t*(131) = 2.14, *p* = .029 and combining, *t*(131) = 2.23, *p* = .028. While drinking energy drinks only, males consumed an average of 1.06 energy drinks (*SD* = .92) per occasion compared to .56 energy drinks (*SD* = .65) for females. While combining energy drinks with alcohol, males consumed an average of 2.39 energy drinks (*SD* = 2.49) per occasion compared to 1.70 energy drinks (*SD* = 1.10) for females. Descriptive statistics for the combined use sample including the means and standard deviations for the Quick Drink Screen (QDS) variables are shown in Tables 4 and 5.

Hypothesis 3 examined 10 selected risk taking behaviors for alcohol use (see Figure 2) between men and women that reported using alcohol within the past year. The total alcohol use expectancy data set contained a total of 281 participants, with 169 male (60.1%) and 112 female (39.9%) participants. Of those that used alcohol and answered the QDS binge drinking question (*n* = 278), 260 or 93.53% of users reported binge drinking in the previous year. Binge drinking was defined as having 5 or more drinks on one occasion for both men and women. The average age of participants was 19.84 (*SD* = 1.29) years. The majority of the sample was of Caucasian descent (*n* = 244, 86.8%) with individuals of African-American (n = 26, 9.3%), Latino/Latina (*n* = 4, 1.4%), biracial/multiracial (*n* = 4, 1.4%) and Asian/Pacific Islander (*n* = 2, .7%) descents comprising the remainder of the sample. One respondent did not answer for race. The total alcohol sample consisted of 65 freshman (23.1%), 83 sophomore (29.5%), 70 junior (24.9%), and 63 (22.4%) senior or graduate student-athletes, with 121 athletes from team sports and 160 athletes from individual sports.

Males reported consuming alcohol an average of 1.58 (*SD* = 1.06) days per week compared to 1.13 (*SD* = .90) for females. On average, males consumed 8.58 (*SD* = 5.30) alcoholic drinks per occasion compared to 4.56 (*SD* = 2.38) for females. Independent samples t-test results indicated that men drank significantly more often, $t(264) = 3.86$, $p = .002$, and significantly more drinks per occasion, $t(242) = 8.49$, $p < .001$, than females.

In examining alcohol binge drinking, males reported binging an average of 45.77 (*SD* = 49.32) times whereas females reported binging an average of 22.87 (*SD* = 40.02) times in the past year. Results indicated that men binged significantly more often than women, $t(267) = 4.26$, $p < .001$. On the variable, greatest number of drinks consumed in one day over the past year, males reported an average of 17.30 (*SD* = 10.02) drinks compared to 8.63 (*SD* = 4.54) for females. Overall, men drank considerably more alcohol than women roughly doubling in the number of binge drinking episodes and amount of alcohol consumed. Independent samples t-test descriptive statistics for the men and women QDS quantity-frequency alcohol measure are shown in Table 6.

Hypothesis Testing

Paired and independent samples t-tests were used to compare mean score differences between the risk taking and negative consequence scales. The 10 variables found within the combined user and alcohol only scales are shown are shown in Figures 1 and 2. The means of the 10 variables were summed to create a total risk taking and negative consequence score for both scales. To answer the 4 research hypotheses, t-tests were run to examine the difference between the total scores of the risk taking and negative consequence scales.

The assumptions for the paired and independent samples t-tests were checked prior to conducting the analyses. To check the internal consistency of the scales, Cronbach's Alpha was performed on each of the 10 item risk taking and negative consequence scales. The combined use risk taking scale was internally consistent with a Cronbach's Alpha of .726 for alcohol and .719 for combined use. If the item, I would sober up quicker was removed and replaced with "I would be loud, boisterous, and noisy" the internal consistency would rise from .726 to .750 for alcohol and .719 to .757 for combined use. However, the item, I would "I would sober up quicker" was a highly significant value so the original pre-determined scale was maintained to measure combined use risk taking. For hypothesis 3, when making comparisons between men and women on alcohol use only, the item "I would sober up quicker" was removed and replaced with "I would be loud, boisterous, and noisy." The alcohol risk taking scale comparing men and women was internally consistent with a Cronbach's alpha of .745.

The combined user negative consequence scale had a Cronbach's Alpha of .639 for alcohol and .737 for combined use. While the Cronbach's Alpha score of .639 appears to be slightly low for alcohol consequences, this was consistent with the internal consistencies found in previous alcohol expectancy research. Previous expectancy research has indicated that user expectancies of consequences are highly dependent on whether the user perceives the effects of alcohol to be good or bad (Ham et al., 2005).

Hypothesis 1. Hypothesis 1 stated that within combined users there would be significant differences in reported risk taking behaviors when athletes used alcohol by itself compared to when they combined alcohol and energy drinks. Using a paired samples t-test, hypothesis 1 was tested by comparing the total mean score of the alcohol risk taking scale to the total mean score of combined use risk taking scale. Prior to analysis, the normality assumption was checked using histograms and the Kolmogorov-Smirnov test, both of which indicated that the data within the risk taking and negative consequence scales were normally distributed. There was a significant correlation between the alcohol and combined risk taking variables, $r(128) = .701$, $p < .001$. Risk taking behaviors were significant, $t(129) = -5.80$, $p = .001$, with an effect size of -.40 and a mean difference of -2.05 indicating increased risk taking with combined use. The average mean score on the 10 selected risk taking variables (scored 1-4 with higher scores indicating more risk) was 24.31 for alcohol ($SD = 4.82$, $SE = .42$), and 26.35 for combined use ($SD = 5.47$, $SE = .48$), with a 95% confidence interval for this difference in the means of -2.74 for the lower and -1.35 for the upper bounds. Results indicated that athletes took significantly more risks when they combined energy drinks with alcohol compared to when they consumed alcohol only.

Within the combined use risk taking scale, 5 questions showed significant differences between alcohol risk taking and combined use risk taking: I would act aggressively $t(130) = -3.68$, $p < .001$. I would be more alert $t(130) = -9.18$, $p < .001$. I would feel stronger $t(130) = -4.55$, $p < .001$. I would sober up quicker $t(129) = -2.96$, $p = .004$. I would drive a motor vehicle $t(129) = -2.78$, $p = .006$. Results indicated that athletes were more likely to act aggressively, felt more alert and stronger, thought that they would sober up quicker, and would be more likely to drive a motor vehicle while combining alcohol and energy drinks. Table 7 summarizes the means and standard deviations of the individual variables found within the combined use risk taking scale and the paired samples t-test results.

Hypothesis 2. Hypothesis 2 stated that within combined users, there would be significant differences in reported negative consequences when athletes drank alcohol by itself compared to when they combined alcohol with energy drinks. Using a paired samples t-test, hypothesis 2 was tested by comparing the total mean scores of alcohol consequences to combined use consequences. There was a significant correlation between the alcohol and combined use negative consequence variables, $r(128) = .735$, $p < .001$. Negative consequences were significant, $t(129) = -6.782$, $p < .001$, with and effect size of -.45 and a mean difference of -2.28 indicating increased negative consequences with combined use. The average mean score on the 10 selected negative consequence variables was 23.88 for alcohol ($SD = 4.45$, $SE = .39$), and 26.15 for combined use ($SD = 5.62$, $SE = .49$), which was significant at the .001 level, with a 95% confidence interval of -2.94 for the lower and -1.61 for the upper bounds. Results indicated that athletes experienced significantly more negative consequences when they combined energy drinks with alcohol compared to when they consumed alcohol only.

Within the combined users negative consequence scale, 5 questions were highly significant including: I would feel dizzy $t(130) = 3.91$, $p < .001$. I would be clumsy $t(130) = 5.87$, $p < .001$. I would not sleep well $t(130) = -7.72$, $p < .001$. I would be nervous or jittery $t(130) = -10.82$, $p < .001$. I would experience a rapid heartbeat $t(130) = -10.67$, $p < .001$. Results indicated that when athletes combined alcohol with energy drinks they expected to have significantly more trouble sleeping, being more nervous or jittery, and experiencing a rapid heartbeat. Furthermore, athletes reported that they were significantly less dizzy and clumsy when combining energy drinks with alcohol. Table 8 summarizes the means and standard deviations of the individual variables found within the negative consequence scale and the paired samples t-test results.

Hypothesis 3. Hypothesis 3 stated that there would be significant differences in reported risk taking behaviors between men and women on alcohol use. Hypothesis 3 was tested using an independent samples t-test on the total alcohol data set by comparing men's (n = 169) and women's (n = 111) mean scores on alcohol risk taking. To test the hypothesis, comparing men and women on alcohol use only, the item "I would sober up quicker" was replaced with "I would be loud, boisterous, or noisy" since it was only valid when comparing alcohol to combined use. The alcohol risk taking scale was internally consistent with a Cronbach's alpha of .745. Prior to conducting the analysis, Levene's test of equality of variance was performed and was not significant indicating that equality of variance assumption was not violated. Gender on alcohol risk taking behaviors was highly significant, n = 280, $t(278) = 4.78$, $p <.001$, with an effect size of .59. The average mean score on alcohol risk taking behaviors was 25.37 for men (SD = 5.15, SE = .40), and 22.50 for women (SD = 4.50, SE = .43), with a mean difference of 2.86. Results indicated that men were likely to take significantly more risks than women while drinking alcohol.

When examining individual variables, men reported taking more risks on all 10 alcohol risk taking variables. Significant gender differences existed on 5 of the alcohol risk taking variables: I would enjoy sex more $t(279) = 3.72$, $p < .001$ with a mean difference of .45. I would act aggressively $t(254) = 3.34$, $p = .001$ with a mean difference of .39. I would feel stronger $t(279) = 2.84$, $p = .005$ with a mean difference of .33. I would drive a motor vehicle $t(271) = 2.10$, $p = .037$ with a mean difference of .21. I would be more likely to fight, $t(279) = 6.12$, $p < .001$, with a mean difference of .81. Therefore, men reported being more likely to act aggressively, feel stronger, drive a motor vehicle, and fight while under the influence of alcohol. Table 9 summarizes the means and standard deviations of the variables found within the alcohol risk taking scale and the independent samples t-test results comparing men and women.

Hypothesis 4. Hypothesis 4 stated that there would be significant differences in reported risk taking behaviors between men and women on combined use. Hypothesis 4 was tested using an independent samples t-test on the combined use data set by comparing men's ($n = 91$) and women's ($n = 39$) mean scores on combined use risk taking. Prior to conducting the analysis, Levene's test of equality of variance was performed and was not significant; indicating that equality of variance assumption was not violated. Gender on combined use risk taking behaviors was highly significant, $n = 130$, $t(128) = 4.45$, $p < .001$, with an effect size of .85. The average mean score on combined use risk taking behaviors was 27.66 for men ($SD = 5.11$, $SE = .54$), and 23.31 for women ($SD = 5.10$, $SE = .82$), with a mean difference of 4.35. Results indicated that men were likely to take significantly more risks than women while combining alcohol with energy drinks.

When examining the variables within the combined use risk taking scale, men reporting taking more risks on all 10 variables. Significant gender differences existed on 4 of the combined use risk taking variables: I would enjoy sex more $t(129) = 3.19$, $p = .002$ with a mean difference of .64, I would act aggressively $t(129) = 3.37$, $p = .001$, with a mean difference of .69. I would drive a motor vehicle $t(116) = 4.04$, $p = .001$, with a mean difference of .65, and I would be more likely to fight $t(129) = 4.82$, $p = .001$, with a mean difference of 1.00. Therefore, men reported that they would enjoy sex more, be more likely to act aggressively, drive a motor vehicle, and to be much more likely to fight than women while under the combined influence of alcohol and energy drinks. Greater mean differences between men and women existed on all 10 variables when energy drinks were combined with alcohol. Table 10 summarizes the means and standard deviations of the variables found within the combined use risk taking scale and the independent samples t-test results comparing men and women.

Discussion

In this chapter, implications of the results presented in the method chapter will be discussed. First, findings from the QDS quantity-frequency measures will be examined and explained with reference to their support or divergence from previous literature. Second, the findings from the B-CEOA and B-CEOCU analyses will be examined in the context of the research hypotheses and explained with reference to their support or divergence from previous expectancy research. Then, theoretical, research, and practical implications of the study will be explored. Finally, limitations of the study will be reviewed and the significant findings summarized.

Discussion of Quick Drink Screen Quantity-frequency Instruments

A national study conducted by the National Collegiate Athletic Association (2001) showed that 78.3% of college athletes had used alcohol within the previous year. A similar study by Green, Uryasz, Petr, and Bray (2001) reported that 80.5% of surveyed student athletes consumed alcohol within the past year. The overall response rate was 64.3% with 637 out of 991 NCAA schools reporting with usable data on 13,914 student-athletes. Although on a much smaller scale, in the current study (*N* = 401), 315 or 78.55% of athletes reported using alcohol within the past year, which is strikingly consistent with national research studies conducted by the NCAA. Leichliter et al. (1998) reported that college athletic team members consumed an average of 9.66 alcoholic drinks per week. In the current study, college athletes (*N* = 401 including non-drinkers) consumed an average of 9.31 alcoholic drinks per week over the past year.

In the Froiland, Koszewski, Hingst, & Kopecky (2004) general supplement use survey conducted on student-athletes (*N*= 203) from a major Division I university, nearly 73% reported using energy drinks as a nutritional supplement. However, electrolyte replacement drinks such as Gatorade® and Powerade® were included. With these drinks included it would be expected for the usage rates to be even higher. Possibly suggesting that their may have been some confusion or disagreement among the athletes as to what exactly constitutes an energy drink. In the current study, on the energy drink QDS instrument (*n* =399), 194 or 48.62% of athletes reported using energy drinks without alcohol. In this study, energy drinks were clearly defined as canned beverages including the main ingredients of B-vitamins, caffeine, taurine, and examples were given of such drinks (Red Bull®, Rockstar®, Full-Throtle®, Amp®, Monster®, etc). It was specifically indicated that coffee, drinks high in caffeine, or electrolyte replacement drinks were not to be included.

From the complete sample (*N* = 401), including those that did not drink, 290 or 72.32% of athletes reported binge drinking in the past year. Within participants that reported drinking, 92.06% reported binge drinking in the past year. Binge drinking was described as 5 or more drinks at one time for both men and women, as opposed to traditional alcohol research where binge drinking is considered 5 drinks for men and 4 drinks for women. The binge drinking rates would have been slightly higher if this distinction would have been made for men and women on this question. However, this distinction was not made because the primary objective of the QDS quantity-frequency instruments was to measure the amount of combined use of alcohol and energy drinks and to sort athletes into groups to test the research hypotheses.

In previous athlete studies that have examined athlete binge drinking, results showed that roughly 50-60% of athletes had binged in the two weeks prior to the surveys (Nelson & Wechsler, 2001; Wechsler et al., 1997). Possibly because of time constraints, in previous athlete alcohol research studies the time period of one year has generally not been used. However, since athletes drinking patterns can vary considerably depending on whether the athlete is in or out of season, the time period of one year was chosen for the current study.

Wechsler et al. (1997) discovered gender differences, with more male athletes reporting binge drinking than female athletes. In their national study 61% of male athletes reported binging in the past two weeks (Wechsler et al., 1997). In later research by Nelson & Wechsler (2001) 57% men and 48% women reported binge drinking in the two weeks prior to the study. Similar to previous research, males in the current study reported a higher incidence of binge drinking and consumed considerably more alcohol than females. Males (n = 166) reported binging an average of 45.77 (SD = 49.32, SE = 3.83) times whereas females (n = 112) reported binging an average of 22.87 (SD = 40.02, SE = 3.78) times in the past year. On the greatest number of drinks consumed in one day over the past year, males (*n* = 169) reported an average of 17.30 (*SD* = 10.02, *SE* = .77) drinks compared to 8.63 (*SD* = 4.54, *SE* = .43) for females (*n* = 112; see Table 6).

Ferreira et al. (2006) and Riesselmann, Rosenbaum, & Schneider (1996) stated that it is important to examine the combined use of energy drinks and alcohol as it may lead to an increase in risk taking behaviors and increased alcohol consumption. Results of the current investigation indicated that combined use did lead to an increase in risk taking behaviors. Furthermore, combined users (*n* = 128) did use considerably more alcohol than those that did not combine (*n* = 143), with the average number of drinks being 5.58 (*SD* = 3.95) for non-combined users and 8.53 (*SD* = 5.18) for combined users. Therefore, combined users did use more alcohol on average than those that did not combine, thus supporting previous suggestions by Ferreira et al. (2006) that combined use may lead to an increase in overall alcohol consumption. It is important to note however, that while combining alcohol with energy drinks, combined users (*n* = 121, paired t-test) reported drinking less alcohol with the average number of drinks being 8.56 (*SD* = 5.20) for alcohol by itself and 6.27 (*SD* = 4.43) for combined use. Yet, even with drinking less alcohol on average while combining, users still reported taking greater risks while combining alcohol and energy drinks.

In combined users, significant differences were also present between male and females on the average amount of alcohol consumed. Males (*n* = 88) consumed an average of 10.12 drinks (*SD* = 5.33, *SE* = .57) when drinking alcohol by itself compared to an average of 7.31 drinks (*SD* = 4.75, *SE* = .52) while combining alcohol with energy drinks. Whereas, females (*n* = 38) consumed an average of 5.17 drinks (*SD* = 2.28, *SE* = .36) when drinking alcohol by itself compared to 3.91 drinks (*SD* = 2.23, *SE* = .36) while combining. Even though combined users reported taking more risks, they drank less alcohol on average while combining, which would disagree with previous research that suggests that the ingredients within energy drinks may lead to increased alcohol consumption. Since combined users are already a group that use alcohol heavily, a plausible reason for this is that energy drinks may be used more on days after heavy drinking to fight the effects of hangovers and lower energy levels the day after drinking. In a reasonable scenario, combined users may drink alcohol only on Friday night, and then combine alcohol with energy drinks on Saturday to fight the hangover and hormonal effects such as reduced serotonin and nor-epinephrine from heavy drinking the night before. From personal interviews with college students this is a common reason cited for using energy drinks.

In previous research, users have reported that energy drinks reduced the negative affects and increased the stimulating effects of alcohol (Ferreira et al., 2004a, 2006). Similar to the findings by Ferreira et al. (2004a, 2006) participants in the current study perceived that energy drinks would reduce the depressant affects and increase the excitatory affects of alcohol on specific questions comparing alcohol to combined use. For example, athletes reported being significantly less dizzy and clumsy ($p < .001$) and being significantly more alert ($p < .001$) when using energy drinks with alcohol. Furthermore, athletes reported that they would feel stronger, sober up quicker, and be more likely to drive a motor vehicle while combining. Results for those variables were as follows: I would feel dizzy $t(130) = 3.91$, $p < .001$. I would be clumsy $t(130) = 5.87$, $p < .001$. I would be more alert $t(130) = -9.18$, $p < .001$. I would feel stronger $t(130) = -4.55$, $p < .001$. I would sober up quicker $t(129) = -2.96$, $p = .004$. I would drive a motor vehicle *t*(129) = -2.787, *p* = .006. These findings supported previous findings by Ferreira et al. (2004a; 2006) which showed that combined users perceived that energy drinks would reduce the negative effects of alcohol. However, it should also be considered that these results could be partially related to the amount of alcohol consumed, as athletes also consumed less alcohol on average while combining when compared to using alcohol only.

Within the study by Ferreira et al. (2006) only small amounts of the energy drink Red Bull® were used, which in a dose dependent manner would scientifically minimize the antagonizing affects of the stimulants found within it. Yet, participants still reported that there was a considerable difference while they combined. Out of 131 combined users, 30 participants used only small amounts of energy drinks with alcohol (1 energy drink or 8 oz.). Yet, again significant differences were still found on users perceptions of energy drinks reducing the depressant effects of alcohol. Thus, results of this study further support the belief that there is a synergistic effect between all of the ingredients found within energy drinks.

Hypothesis 1 stated that within combined users there would be a significant difference in reported risk taking behaviors when athletes use alcohol by itself compared to when they combine energy drinks and alcohol. This hypothesis was soundly supported by the highly significant results of the paired samples t-test which compared the overall means of the alcohol and combined use risk taking scales. Results indicate that athletes took significantly more risks when they combined energy drinks with alcohol compared to when they consumed alcohol only.

Additionally, five items within the combined use risk taking scale showed significant differences between alcohol risk taking and combined use risk taking: I would act aggressively $t(130) = -3.68$, $p < .001$. I would be more alert $t(130) = -9.18$, $p < .000$. I would feel stronger $t(130) = -4.55$, $p < .001$. I would sober up quicker $t(129) = -2.96$, $p = .004$. I would drive a motor vehicle $t(129) = -2.787$, $p = .006$. Indicating that when athletes combined energy drinks with alcohol they reported that they expected to be significantly more likely to act aggressively, be alert, feel stronger, sober up quicker, and being more likely to drive a motor vehicle under the influence. Results suggest that athletes perceived that energy drinks would reduce the depressant side effects of alcohol. On each item, except for (I would enjoy sex more) athletes reported higher mean scores (taking more risks) when combining alcohol with energy drinks.

Ferreira et al. (2006) and Riesselmann et al. (1996) stated that it is important to examine the combined use of energy drinks and alcohol as it may lead to an increase in risk taking behaviors such as drinking and driving. Results of current investigation suggest that users could be more likely to decide to drive a motor vehicle while combining energy drinks with alcohol. Thus, further supporting previous research that combined use may lead to an increase in driving under the influence.

An interesting finding from the QDS quantity-frequency instruments was the number of participants that only used energy drinks while drinking alcohol. The average number of energy drinks used without alcohol was below 1 because 47 combined users reported that they had not used energy drinks without alcohol in the past year. This is a significant finding as it gives further insight that the use of alcohol can lead to an increase in energy drink use. A likely reason for this is the availability of energy drinks in bars and the use of energy drinks as a mixer with alcohol. Several athletes self-reported that they only used energy drinks as a mixer with shots, which are known as “Bombs”. It is common for bars to have specials on “Bombs” which are commonly mixed with “Yeager” or flavored vodka’s.

For combined use comparisons, the item “I would sober up quicker” could have been replaced with “I would be loud, boisterous, and noisy” to increase the Cronbach’s alpha from .736 to .750 for alcohol and .719 to .757 for combined use. However, results indicated that the item “I would sober up quicker” was highly significant and the item was thought to be of high value to the study. To ensure that this type of comparison question was logical, participants were briefed that they would be answering for both alcohol and combined use prior to filling out the instruments.

Results with the item “I would sober up quicker” deleted and replaced with “I would be loud, boisterous, and noisy” were similar. There was a significant correlation between the alcohol and combined risk taking variables n =130, $r(128) = .736$, $p < .001$. Risk taking behaviors were highly significant at the .05 level, $t(129) = -4.968$, $p = .001$. The average mean score on the 10 selected risk taking variables (scored 1-4 with higher scores indicating more risk) was 25.69 for alcohol ($SD = 5.06$), and 27.42 for combined use ($SD = 5.73$), with a 95% confidence interval for this difference of the means of -2.42 for the lower and -1.04 for the upper bounds. With “I would sober up quicker” deleted, results still indicated that athletes took significantly more risks when they combined energy drinks with alcohol compared to when they consumed alcohol only.

Hypothesis 2 stated that within combined users, there would be significant differences in reported negative consequences when they drank alcohol by itself compared to when they combined energy drinks and alcohol. This hypothesis was supported by the highly significant results ($p < .001$) of the paired samples t-test which compared the overall means of the alcohol and combined use negative consequence scales. Results indicate that athletes suffered significantly more negative consequences when they combined energy drinks with alcohol compared to when they consumed alcohol only.

Additionally, 5 items within the combined use negative consequence scale were significant including: I would feel dizzy $t(130) = 3.91$, $p < .001$. I would be clumsy $t(130) = 5.87$, $p < .001$. I would not sleep well $t(130) = -7.72$, $p < .001$. I would be nervous or jittery $t(130) = -10.82$, $p < .001$. I would experience a rapid heartbeat $t(130) = -10.67$, $p < .001$. Results indicated that when athletes combined alcohol with energy drinks they expected to have significantly more trouble sleeping, being more nervous or jittery, and experiencing a rapid heartbeat. All negative consequences that could be expected with a high level of stimulant use. Furthermore, athletes reported that they were significantly less dizzy and clumsy when combining energy drinks with alcohol. However, it should be considered that these results are likely related to the amount of alcohol consumed as athletes consumed considerably less alcohol while combining compared to when they used alcohol only.

It should also be noted that there was little difference in athlete’s expectations of getting a hangover ($M = -.01$) while combining energy drinks with alcohol, especially since athletes consumed considerably less alcohol while combining. Furthermore, previous research on the main ingredients found within energy drinks, particularly research on B-vitamins, glucose, and taurine indicate that these substances should partially reduce the negative hangover side effects of alcohol (McArdle et al., 1996; Ferreira et al., 2004b; 2006; Vohra & Hui, 2000; Olive, 2002). A partial explanation for this is that alcohol rapidly depletes the body's stores of B-vitamins, which can lead to side effects such as lack of energy and headaches (McArdle et al., 1996). Thus, energy drinks should help reduce alcohols vitamin leaching effects. Another effect caused by the metabolism of alcohol is that it causes users to become hypoglycemic due to alcohol inhibiting the livers ability to convert carbohydrates into glucose while alcohol is present in the blood (Freinkel & Ronald, 1966; Freinkel et al., 1988). Some of the side effects of alcohol induced hypoglycemia include problems with thinking and memory, brain damage, dizziness, clumsiness, rapid heartbeat, and difficulty sleeping. Alcohol induced hypoglycemia is a significant contributor the hangover symptoms caused by alcohol (Freinkel et al., 1988). Since energy drinks directly contain glucose they should theoretically help keep the user from becoming hypoglycemic while alcohol is present in the body. Thus, it would make sense for energy drinks directly containing glucose to slightly reduce the hypoglycemic side effects such as dizziness and clumsiness, which agrees with the results from the current investigation. "Taurine is one of the most abundant amino acids found naturally in the central nervous system and it has several important functions in physiological processes such as osmoregulation, neuroprotection, and neuromodulation" (Olive, 2002, p. 345). Microdialysis studies have shown that ethanol raises extracellular levels of taurine in numerous brain regions (Olive, 2002). In experiments with mice, Vohra & Hui (2000) showed that taurine can be effective in reducing the symptoms of amnesia induced by alcohol without compromising other behavioral aspects. Similar to alcohols leaching effects on vitamins, alcohol can also cause a person to become deficient in taurine, which could possibly lead to hangover side effects. With all of these qualities considered towards the hangover question, the sleep side effects caused by the stimulants found in energy drinks such as caffeine could likely balance out any of the positive effects such as reducing vitamin deficiencies and alcohol induced hypoglycemia.

Hypothesis 3 stated that there would be significant differences in reported risk taking behaviors between men and women on alcohol use. To test hypothesis 3, comparing men and women on alcohol use only, the item “I would sober up quicker” was logically replaced since it is only valid when comparing alcohol to combined use. This hypothesis was supported by the highly significant results ($p < .001$) of the independent samples t-test which compared the overall means of the alcohol and combined use risk taking scales. Results indicated that men were likely to take significantly more risks then women while drinking alcohol.

When examining individual variables, men reported taking more risks on all 10 alcohol risk variables. Significant gender differences existed between men and women on 5 of the alcohol risk taking variables: I would enjoy sex more $t(279) = 3.72$, $p < .001$ with a mean difference of .45. I would act aggressively $t(254) = 3.34$, $p = .001$, with a mean difference of .39. I would feel stronger $t(279) = 2.84$, $p = .005$, with a mean difference of .33. I would drive a motor vehicle $t(271) = 2.10$, $p = .037$, with a mean difference of .21. I would be more likely to fight $t(279) = 6.12$, $p < .001$, with a mean difference of .81.

Agreeing with previous alcohol research, results indicated that men were more likely to act aggressively, drive a motor vehicle, and fight while under the influence of alcohol. Results of studies on drinking and sexual behavior have shown that men and women differ in their beliefs about the effects of alcohol on sexual responding (Leigh, 1990; Mongeau & Johnson, 1995). In addition, expectations of sexual enhancement and disinhibition were related to the initiation of sexual activity, number of sexual encounters that took place while drinking, and the amount of alcohol consumed (Leigh, 1990). In previous B-CEOA expectancy research, there has been a trend for greater expectancies related to enhanced sexuality from drinking to be related to greater alcohol related problems (Ham et al., 2005). Agreeing with other alcohol expectancy research, males in this study reported having higher sexual expectancies with alcohol than females (Mongeau & Johnson, 1995).

Hypothesis 4 stated that there would be significant differences in reported risk taking behaviors between men and women on combined use. This hypothesis was supported by the highly significant results ($p < .001$) of the independent samples t-test which compared the overall means of the combined use risk taking scale. Results indicated that men took significantly more risks then women when combining alcohol with energy drinks.

Significant gender differences existed between men and women on 4 of the combined use risk taking variables: I would enjoy sex more $t(129) = 3.19$, $p = .002$ with a mean difference of .64, I would act aggressively $t(129) = 3.37$, $p = .001$, with a mean difference of .69. I would drive a motor vehicle $t(116) = 4.04$, $p = .001$, with a mean difference of .65, and I would be more likely to fight $t(129) = 4.82$, $p = .001$, with a mean difference of 1.00. Another variable that was nearly significant was, I would be courageous $t(129) = 2.74$, p = .059, with a mean difference of .32 between men and women. Results indicated that men reported being considerably more likely to expect to enjoy sex more, act aggressively, drive a motor vehicle, and fight while under the combined influence of alcohol and energy drinks. Surprisingly, the item I would feel stronger, was not significant between men and women for combined use, even though it was a significant variable when examining differences for alcohol only use. Refer to Table 12 for results of the individual variables.

Results indicated greater mean differences between men and women for each variable when alcohol was combined with energy drinks. A likely contributor to this is that men consumed considerably more alcohol and energy drinks than women. When combining alcohol with energy drinks men consumed an average of 7.31 (*SD* = 4.75) alcoholic drinks and 2.39 (*SD* = 2.49) energy drinks per occasion compared to 3.91 (*SD* = 2.23) alcoholic drinks and 1.70 (*SD* = 1.10) energy drinks per occasion for women. Therefore, proportionally women consumed more energy drink per alcoholic drink than men. Results indicate that the combined use drinking patterns of men are riskier than women.

It is interesting to note that both men and women reported drinking considerably less alcohol on average and as their greatest number of drinks when they combined alcohol with energy drinks. Previous research by Ferriera et al. (2006) has suggested that combined use could lead to an increase in the amount of alcohol consumed. Results do suggest that combined users consume more alcohol than those that do not combine when they drink alcohol only. However, combined users appear to drink less alcohol while they are using energy drinks. While consuming alcohol only men drank an average of 10.12 drinks per occasion with the average greatest number of drinks on one occasion being 21.76 (*SD* = 10.42) compared to an average of 7.31 drinks per occasion with an average greatest number of 12.88 (*SD* = 8.42) while combining. While consuming alcohol only women drank an average of 5.17 drinks per occasion with the average greatest number of drinks on one occasion being 10.38 (*SD* = 5.38) compared to an average of 3.91 drinks per occasion with an average greatest number of 6.29 (*SD* = 4.05) while combining.

Implications for Future Research

With researchers suggesting that the combination of energy drinks and alcohol can lead to increased risk taking behaviors and health problems (Ferreira et al., 2006), and athletes being shown to be likely to drink both of these substances (Froiland et al., 2004; Leichliter et al., 1998; Wechsler et al., 1997), there is a clear need for further combined use research. The current research study indicated that the combination of alcohol and energy drinks leads to an increase in risk taking behaviors and negative health consequences. Therefore, combined use consumption rates and athletes expectancies of combined use should be studied in greater detail. It would be a good idea for the NCAA and other researchers to start measuring the amount of energy drinks that athletes are consuming as they are a potential health risk. Further research should be conducted on athletes and non-athletes to examine their amount of use and expectancies of using alcohol vs. the combined use of alcohol and energy drinks. The health risks and reasons for using energy drinks should also be further examined. Further scientific research should also be conducted on the effects of energy drinks on alcohol metabolism.

Implications for Practice

Currently, NCAA schools have alcohol education programs. As part of this, the risks associated with combined use should be discussed as it may lead to an increase in alcohol consumption, risk taking behaviors, and negative health consequences. It would be a good idea for coaches to address these issues with their athletes to educate them about the dangers of combined use. Furthermore, the health risks and use of energy drinks without alcohol before practices, weight training, studying, or other various reasons should be addressed. In several circumstances, it has been witnessed that the use of energy drinks before athletic competitions and training sessions has not been greatly discouraged. For example, at the 2005 World Outdoor Track and Field Championships, energy drinks were a complimentary beverage made readily available for the athletes to use at the competition site. It has become common for athletes who have had trouble sleeping or feel under aroused to use energy drinks prior to and even during competitions - a risky practice for those who may have underlying heart conditions.

In previous research, users have reported that energy drinks reduce the negative affects and increase the stimulating effects of alcohol (Ferreira et al., 2006). By researching how widespread these beliefs are we can better determine why energy drinks may be leading to increased risk taking behaviors and negative health consequences in college athletes. By investigating athlete's expectations of combined use it will help determine why athletes are using this combination. This research could help protect future athletes from experiencing the negative consequences of using energy drinks and alcohol. By better understanding athletes' expectancies of using energy drinks and alcohol, we may be able to help athletes more effectively.

Limitations

As with all studies, the present investigation has limitations. Although the sample demographics were representative of the athletic department from which they were drawn, there was very little racial/ethnic diversity. Thus, the results of the study may not generalize as well to non-Caucasian racial/ethnic groups. Furthermore, results of this study are on a specific population of Division I athletes, which may not generalize as well to other populations. As with other expectancy research, results of the current study are limited to indicating participant level of agreement. Another limitation was that the research was based on Likert scale scoring (Scored1-4 disagree-agree) asking participants for their level of agreement on questions. Therefore, this study was limited by the assumption that a higher level of agreement indicates an increase in risk and negative health consequences. For questions such as "I would drive a motor vehicle" we do not know if they did in fact drive a motor vehicle or if they perceived that they would be more likely to drive under the influence. Finally, in any self-report data there is a concern with social desirability and the truthfulness of participants' responses. The effects of these concerns were held to a minimum in the present investigation through assurances of confidentiality and requests for honesty in responding.

Summary of Findings

Results of this study support many previous quantity-frequency and expectancy research findings. However, there were a few discrepancies from previous research. Ferriera et al. (2006) suggested that it is important to examine the combined use of alcohol and energy drinks as it may lead to an increase in risk taking behaviors such as drinking and driving and increased alcohol consumption. Results indicated that athletes took significantly more risks and were more likely to drive under the influence when they combined alcohol with energy drinks. Results also indicated that athletes experienced significantly more negative consequences when they combined alcohol with energy drinks. It is important to note that combined users drank considerably less alcohol when they used alcohol with energy drinks. Yet, athletes still reported taking significantly more risks and experienced significantly more negative consequences. Within combined users, men and women consumed an average of 10.12 and 5.17 drinks with alcohol only compared to 7.31 and 3.91 when combining alcohol with energy drinks. On the greatest number of alcoholic drinks on one occasion, both men and women combined users consumed nearly double the amount of alcohol when they did not combine. However, in considering combined use as a risk factor for increased alcohol consumption, combined users did consume significantly more alcohol than athletes that used alcohol only. Agreeing with previous combined use research by Ferreira et al. (2006), results of the current investigation indicated that athletes also expected for energy drinks to reduce the depressant side affects of alcohol and to increase its excitatory effects. Supporting previous research, results indicated that men were likely drink more and to take significantly more risks then women while drinking alcohol. Results also indicated that men took significantly more risks when combining alcohol with energy drinks. This study has great practical significance and should serve as a catalyst for continued research on the combined use of alcohol and energy drinks.

References

Addictive Behaviors Research Center. (1997). *The alcohol skills training program facilitators manual.* Unpublished manual, Psychology Department, University of Washington.

Alford, C., Cox, H., & Wescott, R. (2001). The effects of red bull energy drink on human performance and mood. *Amino Acids*, 21, 139-150.

Bauer, L., & Smith, J. (2006, October 26). Juicy jolts or risky sips? *The Kansas City Star*, pp. A1, A4.

Benjamin, J., Li, L., Patterson, C., Greenberg, B. D., Murphy, D., & Hamer, D. (1996). Population and familial association between the D4 dopamine receptor gene and measures of novelty seeking. *Nature Genetics*, 12, 81-84.

Brown, S. A. (1985). Expectancies versus background in the prediction of college drinking patterns. *Journal on Consulting and Clinical Psychology*, 53(1), 123-130.

Brown, S. A., Goldman, M., Inn, A., & Anderson, L. (1980). Expectations of reinforcement by alcohol: Their domain and relation to drinking patterns. *Journal of Consulting and Clinical Psychology*, 48, 419-426.

Bunsen, N. (1991). Development of an adolescent risk-taking instrument. *Journal Child Practical Nursing*, 4(4), 143-149.

The Core Institute. (1998). Recent statistics on alcohol and other drug use on American college campuses: 1995-1996. (1998). Carbondale, IL: The Core Institute.

Carey, K. B., & Correia, C. J. (1997). Drinking motives predict alcohol-related problems in college students. *Journal of Studies on Alcohol*, 58, 100-105.

Clark, D., Sommerfeldt, L., Schwarz, M., Hedeker, D., & Watel, L. (1990). Physical recklessness in adolescence trait or byproduct of depressive/suicidal states? *The Journal of Nervous Mental Disease*, 178(7), 423-433.

Deixelberger-Fritz, D., Tischler, M. A., & Kallus, K. W. (2003). Changes in performance, mood state and workload due to energy drinks in pilots. *International Journal of Applied Aviation Studies*, 3(2), 195-205.

Engs, R. C. & Hanson, D. J. (1985). The drinking patterns and problems of college students: 1983. *Journal of Alcohol and Drug Education*, 31(l), 65-83.

Ferreira, S. E., Mello, M. T., Pompe´ia, S., & Souza-Formigoni, M. L. O. (2006). Effects of energy drink ingestion of alcohol intoxication. *Alcoholism: Clinical and Experimental Research*, 30(4), 598-604.

Ferreira, S. E., Mello, M. T., & Souza-Formigoni, M. L. O. (2004a). Can energy drinks affect the effects of alcoholic beverages? A study with users. *Rev. Assoc. Med. Bras.*, 50, 48-51.

Ferreira, S. E., Mello, M. T., Rossi, M. V., & Souza-Formigoni, M. L. O. (2004b). Does an energy drink modify the effects of alcohol in a maximal effort test? *Alcohol Clinical Experimental Research*, 28, 1408-1412.

Ferreira, S. E., Quadros, I. M. H., Trindade, A. A., Takahashi, S., Koyama, R. G., & Souza-Formigoni, M. L. O. (2004c). Can energy drinks reduce the depressor effect of ethanol? An experimental study in mice. *Physiology of Behavior*, 82, 841-847.

Freinkel, N., & Arky, R. A. (1966). Effects of alcohol on carbohydrate metabolism in man. *Human Behavior & Biology*, 27(4), 551-563.

Freinkel, N., Singer, D. L., Arky, R. A., Bleicher, S. J., Anderson, J. B., Silbert, C. K. (1988). Journal of Clinical Investigation, April; 81(4): 1137–1145.

Froiland, K., Koszewski, W., Hingst, J., & Kopecky, L. (2004). Nutritional supplement use among college athletes and their sources of information. *International Journal of Sport Nutrition & Exercise Metabolism*, 14(1), 104-20.

Fromme, K., Stroot, E., & Kaplan, D. (1993). Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. *Psychological Assessment*, 5(1), 19-26.

Graham, T. E. (2001). Caffeine and exercise metabolism, endurance and performance. *Sports Medicine*, 31(11), 785-807.

Green, A., Uryasz, F., Petr, T., & Bray, C. (2001). NCAA study of substance use and abuse habits of college student athletes. *Clinical Journal of Sport Medicine*, 11, 51-56.

Ham, L. S., Stewart, S. H., Norton, P. J. & Hope, D. A. (2005). Psychometric assessment of the comprehensive effects of alcohol questionnaire: Comparing a brief version to the original full scale. *Journal of Psychopathology and Behavioral Assessment*, 27(3), 141-158.

Hildebrand, K., Johnson, D., & Bogle, K. (2001). Comparison of patterns of alcohol use between high school and college athletes and non-athletes. *College Student Journal*, 35, 358-365

Horvath, P. & Zuckerman, M. (1993). Sensation seeking, risk appraisal, and risky behavior. *Personality and Individual Differences*, 16, 109-125.

Irmak, C., Block, L. G., & Fitzsimons, G. J. (2005). The placebo effect in marketing: sometimes you just have to want it to work. *Journal of Marketing Research*, XLII, 406-409.

Jackson, C. & Matthews, G. (1988). The prediction of habitual alcohol use from alcohol related expectancies and personality. *Alcohol & Alcoholism*, 23(4), 305-314.

Kane, J. (1971). Personality, arousal, and performance. *International Journal of Sport Psychology*, 2(1), 338-346.

Kassel, J. D., Jackson, S. I. & Unrod, M. (2000). Generalized expectancies for negative mood regulation and problem drinking among student athletes. *Journal of Studies on Alcohol*, 61, 332-340.

Kerr, J. (1991a). Arousal-seeking in risk sport participants. *Personality and Individual Differences*, 12(6), 613-616.

Lecci, L., MacLean, M. G. & Croteau, N. (2002). Personal goals as predictors of college student drinking motives, alcohol use and related problems. Journal of Studies on Alcohol, 63, 620-630.

Leigh, B. C. (1990). The relationship of sex-related alcohol expectancies to alcohol consumption and sexual behavior. *Addiction*, 85(7), 919–928.

Leichliter, J. S., Meilman, P. W., Presley, C. A., Cashin, J. R. (1998). Alcohol use and related consequences among students with varying levels of involvement in college athletics. *Journal of American College Health*, 46, 257-262.

Liguori, A., Robinson, J. H. (2001). Caffeine antagonism of alcohol-induced driving impairment. *Drug and Alcohol Dependence*, 63(2), 123-129.

McArdle, W. D., Katch, F. I., Katch, V. L. (1996). *Exercise physiology: Energy, nutrition and human performance (4th ed.)*. Baltimore: Lippincott Williams & Wilkins.

Merriam-Webster Online Dictionary. (2007). Retrieved May 8, 2007, from http://mw1.merriam-webster.com/dictionary/Extraversion

Martens, M. P., Cox, R. H., & Beck, N. C. (2003). Negative consequence of intercollegiate athlete drinking: The role of drinking motives. *Journal of Studies on Alcohol*, 64, 825-828.

Martin, C. M., & Hoffman, M. A. (1993). Alcohol expectancies, living environment, peer influence, and gender: A model of college student drinking. *Journal of College Student Development*, 34, 206-211.

McMillian, D., Smith, S., & Wells-Parker, E. (1989). The effects of alcohol, expectancy, and sensation seeking on driving risk taking. *Addictive Behaviors*, 14(4), 477-483.

Miller, W. R., & Del Boca, F. K. (1994). Measurement of drinking behavior using the Form 90 family of instruments. *Journal of Studies on Alcohol*, Supplement No. 12 pp. 112-118.

Mongeau, P. A., & Johnson, K. L. (1995). Predicting cross-sex first-date sexual expectations and involvement: Contextual and individual difference factors. *Personal Relationships*, 2(4), 301–312.

National Collegiate Athletic Association. (2001). NCAA study of substance use habits of college student-athletes. Retrieved on November 14, 2006 from http://www.ncaa.org/library/research/substance_use_habits/2001/substance_use_abits.pdf

Nattiv, A., & Puffer, J. (1991). Lifestyles and health risks of collegiate athletes. *The Journal of Family Practice*, 33, 585-590.

Nelson, T., & Wechsler, H. (2001). Alcohol and college athletes. *Medicine and Science in Sports and Exercise*, 33, 43-47.

Olive, M. F. (2002). Interactions between taurine and ethanol in the central nervous system. *Amino Acids*, 23, 345-357.

Presley, C. A., Meilman, P. W., & Cashin, J. R. (1996a). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 4), 1992-94*. Carbondale, IL: Core Institute, Southern Illinois University.

Presley, C. A., Meilman, P. W., & Lyerla, R. (1995). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 2), 1990-92*. Carbondale, IL: Core Institute, Southern Illinois University.

Presley, C. A., Meilman, P. W., Cashin, J. R. & Lyerla, R. (1996b). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 3), 1991-93*. Carbondale, IL: Core Institute, Southern Illinois University.

Reis, J., & Riley, W. L. (2000). Predictors of college students' alcohol consumption: Implications for student education. *The Journal of Genetic Psychology*, 16(3), 282-291.

Reyner, L. A., & Horne, J. A. (2001). Beneficial effects of an "energy drink" given to sleepy drivers. *Amino Acids*, 20, 83-89.

Reyner, L. A., & Horne, J. A. (2002). Efficacy of a functional energy drink in counteracting driver sleepiness. *Physiology and Behavior*, 75, 331-335.

Riesselmann, B., Rosenbaum, F., & Schneider, V. (1996). Alcohol and energy drink – can combined consumption of both beverages modify automobile driving fitness? *Blutalkohol*, 33, 201-208.

Scholey, A. B., & Kennedy, D. O. (2004a). Cognitive and physiological effects of an "energy drink": an evaluation of the whole energy drink and of glucose, caffeine and herbal flavoring fractions. *Psychopharmacology*, 176, 320-330.

Scholey, A. B., & Kennedy, D. O. (2004b). A glucose-caffeine 'energy drink' ameliorates subjective and performance deficits during prolonged cognitive demand. *Appetite*, 42, 331-333.

Seidl, R., Peyrl, A., Nicham, R., Hauser, E. (2000). A taurine and caffeine-containing drink stimulates cognitive performance and well-being. *Amino Acids*, 19, 635-642.

Shiv, B., Carmon, Z., & Ariely, D. (2005). Placebo effects of marketing actions: consumers may get what they pay for. *Journal of Marketing Research*, XLII, 383-393.

Smit, H. J., & Rogers, P. J. (2002). Effects of 'energy' drinks on mood and mental performance: critical methodology. *Food Quality and Preference*, 13, 317-326.

Sobell, L. C, Agrawal, S., Sobell, M. B., Leo, G. I., Young, L. J., Cunningham, J. A., & Simco, E. R. (2003). Comparison of a quick drinking screen with the timeline followback for individuals with alcohol problems. *Journal of Studies on Alcohol*, 64, 858-861.

Sobell, L. C., & Sobell, M. B. (2003). Alcohol consumption measures. In J. P. Allen, & V. Wilson (Eds.), *Assessing alcohol problems*. (2nd Ed., pp. 78-99). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

Valdivia, I., & Stewart, S. H. (2005). A further examination of the psychometric properties of the Comprehensive Effects of Alcohol Questionnaire. *Cognitive Behavior Therapy*, 34(1), 22-33.

Vohra, B. P., & Hui, X. (2000). Improvement of impaired memory in mice by taurine. *Neural Plast*, 7, 245-59.

Warburton, D. M., Bersellini, E., & Sweeney, E. (2001). An evaluation of a caffeinated taurine drink on mood, memory and information processing in healthy volunteers without caffeine abstinence. *Psychopharmacology*, 158, 322-328.

Wechsler, H., Davenport, A. E., Dowdall, G. W., Grossman, S. J., & Zanakos, S. I. (1997). Binge drinking, tobacco, and illicit drug use and involvement in college athletics. *Journal of American College Health*, 45, 195-200.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B. & Costillo, S. (1994). Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *Journal of the American Medical Association*, 272, 1672-1677.

Wechsler, H., Moeykens, B., Davenport, A., Castillo, S., & Hansen, J. (1995). The adverse impact of heavy episodic drinkers on other college students. *Journal of Studies on Alcohol*, 56, 628-634.

Wikipedia, The Free Encyclopedia. (2007, May 29). Red bull new york. Retrieved May 30, 2007, from http://en.wikipedia.org/wiki/Red_Bull

Wood, M. D., Nagoshi, C. T. & Dennis, D. A. (1992). Alcohol norms and expectations as predictors of alcohol use and problems in a college student sample. *American Journal of Drug and Alcohol Abuse*, 18, 461-476.

Zuckerman, M. (1971). Dimensions of sensation seeking. *Journal of Consulting and Clinical Psychology*, 36(1), 45-52.

Zuckerman, M. (1983). Sensation seeking and sports. *Personality and Individual Differences*, 4(3), 285-292.

Zuckerman, M. (1996). The psychobiological model for impulsive unsocialized sensation seeking: A comparative approach. *Neuropsychobiology*, 34, 125-129.

Table 1

Quick Drink Screen Distribution by Gender and Sport (N = 401)

Variable	Male	Female
Baseball	31	0
Basketball	9	4
Cross Country	15	13
Football	98	0
Golf	10	11
Gymnastics	0	14
Soccer	0	21
Softball	0	19
Swimming & Diving	28	22
Tennis	0	9
Track & Field	31	21
Wrestling	35	0
Volleyball	0	10

Table 2

Hypotheses 1, 2, & 4 Distribution by Gender and Sport (n = 132)

Variable	Male	Female
Baseball	16	0
Basketball	0	0
Cross Country	1	4
Football	34	0
Golf	3	2
Gymnastics	0	4
Soccer	0	7
Softball	0	1
Swimming & Diving	15	16
Tennis	0	3
Track & Field	7	0
Wrestling	15	0
Volleyball	0	4

Table 3

Hypothesis 3 Alcohol Only Distribution by Gender and Sport (n = 281)

Variable	Male	Female
Baseball	27	0
Basketball	2	0
Cross Country	11	13
Football	51	0
Golf	6	9
Gymnastics	0	13
Soccer	0	18
Softball	0	16
Swimming & Diving	25	19
Tennis	0	6
Track & Field	22	11
Wrestling	25	0
Volleyball	0	7

Table 4

Quick Drink Screen Descriptive Statistics for the Combined Use Sample

Variable	*N*	*M*	*SD*
1. Alcohol days/week	132	1.76	.95
1. Combined days/week	132	0.85	.83
1. Energy drink days/week	132	1.24	2.17
2. Alcohol average # drinks	127	8.60	5.14
2a. Combined average # alcohol drinks	123	6.28	4.41
2b. Combined average # energy drinks	132	2.17	2.18
2. Energy drink average drinks	132	0.90	0.87
3. Alcohol binge drinking	130	54.89	50.85
3a. Combined alcohol binge	131	16.00	22.79
3b. Combined energy binge	131	8.21	16.50
3. Energy drink binge	132	2.69	8.83
4. Alcohol greatest # of drinks	132	18.23	10.56
4a. Combined greatest # of alcohol	132	10.83	7.94
4b. Combined greatest # of energy	132	3.41	3.01
4. Energy drink greatest #	132	2.10	3.11
Combined use energy binge drinking	81	8.21	16.50
Energy drink binge without alcohol	43	2.69	8.83

Table 5

Quick Drink Screen Independent Samples t-test Descriptive Statistics for the Combined Use Sample (n = 132)

Variable	Male			Female		
	N	*M*	*SD*	*N*	*M*	*SD*
Alcohol days/week	91	1.94	0.93	41	1.38	0.90
Combined use days/week	91	0.88	0.78	41	0.79	0.93
Energy drinks only days/week	91	1.52	2.49	41	0.63	0.99
Average # alcoholic drinks	88	10.12	5.33	39	5.17	2.28
Average # alco. drinks comb.	85	7.31	4.75	38	3.91	2.23
Average # energy drinks comb.	91	2.39	2.49	41	1.70	1.10
Average # energy drinks only	91	1.06	0.92	41	0.56	0.65
Greatest # of alcoholic drinks	91	21.76	10.42	41	10.38	5.38
Comb. greatest # alco. drinks	91	12.88	8.42	41	6.29	4.05
Comb. energy drink greatest #	91	3.77	3.42	41	2.59	1.50
Energy drink only greatest #	91	2.59	3.57	41	0.98	0.99

Table 6

Quick Drink Screen Independent Samples t-test Descriptive Statistics for Total Alcohol Use Sample (n = 281)

Variable	Male			Female		
	N	*M*	*SD*	*N*	*M*	*SD*
Alcohol days/week	169	1.58	1.06	112	1.13	0.90
Alcohol average # drinks	163	8.58	5.30	108	4.56	2.38
Alcohol binge drinking	166	45.77	49.32	112	22.87	40.02
Alcohol greatest # of drinks	169	17.30	10.02	112	8.63	4.54

Table 7

Paired Samples t-test Results of Variables within the Combined Use Risk Taking Scale (n = 131)

Variable (I would…)	Alcohol		Combined		Paired Samples t-test					
	M	*SD*	*M*	*SD*	M_{dif}	*SD*	*ES*	*t*	*df*	*sig.*
Enjoy sex more	2.69	1.03	2.61	1.09	.08	0.83	.07	1.06	130	.294
Be brave and daring	3.17	0.77	3.06	0.93	.11	0.91	.13	1.34	130	.183
Be courageous	3.00	0.77	3.02	0.90	-.02	0.85	.03	-0.31	130	.757
Act aggressively	2.46	0.95	2.76	1.12	-.30	0.93	.29	-3.68	130	.000**
Take risks	3.18	0.72	3.21	0.81	-.03	0.76	.04	-0.46	130	.648
Be more alert	1.79	0.74	2.69	1.02	-.91	1.13	1.03	-9.18	130	.000**
Feel stronger	2.25	1.01	2.66	1.09	-.41	1.04	.39	-4.55	130	.000**
Sober up quicker	1.72	0.81	2.04	1.02	-.32	1.25	.35	-2.96	129	.004*
Drive a motor vehicle	1.57	0.97	1.75	1.05	-.18	0.76	.18	-2.79	129	.006*
Be more likely to fight	2.45	1.13	2.50	1.86	-.05	0.73	.04	-0.72	130	.475

*$p < .01$, **$p < .001$

Table 8

Paired Samples t-test Results of Variables within the Combined Use Negative Consequence Scale (n = 131)

Variable (I would…)	Alcohol		Combined		Paired Samples t-test					
	M	*SD*	*M*	*SD*	M_{dif}	*SD*	*ES*	*t*	*df*	*sig.*
Feel dizzy	3.02	0.89	2.67	1.06	.34	1.01	.35	3.91	130	.000**
Be clumsy	3.17	0.81	2.69	1.01	.47	0.92	.52	5.87	130	.000**
Be loud, boisterous, or noisy	3.10	0.96	3.11	0.98	-.01	0.85	.01	-0.10	130	.919
Feel guilty	1.82	0.90	1.89	0.90	-.06	0.71	.07	-0.99	130	.327
Feel moody	2.17	0.98	2.22	0.96	-.05	0.81	.05	-0.65	129	.515
Not sleep well	1.87	0.98	2.71	1.15	-.84	1.25	.79	-7.72	130	.000**
Be nervous or jittery	1.49	0.68	2.47	1.08	-.98	1.03	1.11	-10.82	130	.000**
Get a hangover	2.75	0.96	2.76	1.04	-.01	0.99	.01	-0.09	130	.930
Experience a rapid heartbeat	1.85	0.85	2.90	1.06	-1.05	1.12	1.09	-10.67	130	.000**
Be more likely to get injured	2.63	1.05	2.72	1.04	-.08	0.86	.08	-1.12	130	.266

**p < .001

Table 9

Independent Samples t-test Results for Alcohol Risk Taking Variables Comparing Men (n = 169) and Women (n = 112)

Variable (I would…)	Male		Female		Independent Samples t-test				
	M	*SD*	*M*	*SD*	M_{dif}	*ES*	*t*	*df*	*sig.*
Enjoy sex more	2.72	1.04	2.27	0.91	.45	.46	3.72	279	.000***
Be loud, boisterous, or noisy	3.02	0.96	3.01	0.93	.01	.01	0.13	279	.899
Be brave and daring	3.05	0.82	2.87	0.83	.18	.22	1.81	279	.071
Be courageous	2.92	0.81	2.73	0.82	.19	.23	1.87	279	.063
Act aggressively	2.43	1.02	2.04	0.92	.39	.40	3.34	254	.000***
Take risks	3.05	0.86	2.86	0.86	.20	.22	1.87	279	.062
Be more alert	1.82	0.72	1.71	0.73	.11	.15	1.23	279	.220
Feel stronger	2.26	0.99	1.93	0.91	.33	.35	2.84	279	.005**
Drive a motor vehicle	1.51	0.93	1.78	0.72	.21	.32	1.99	271	.037*
Be more likely to fight	2.59	1.13	1.78	1.02	.81	.75	6.12	279	.000***

*$p < .05$, **$p < .01$, ***$p < .001$

Table 10

Independent Samples t-test Results for the Combined Use Risk Taking Variables Comparing Men (n = 91) and Women (n = 40)

Variable (I would…)	Male		Female		Independent Samples t-test				
	M	*SD*	*M*	*SD*	M_{dif}	*ES*	*t*	*df*	*sig.*
Enjoy sex more	2.81	1.05	2.18	1.06	0.64	.58	3.19	129	.002*
Be brave and daring	3.09	0.94	3.00	0.91	0.09	.11	0.50	129	.619
Be courageous	3.12	0.84	2.80	0.99	0.32	.38	1.90	129	.059
Act aggressively	2.97	1.07	2.28	1.11	0.69	.58	3.37	129	.000**
Take risks	3.24	0.79	3.15	0.86	0.09	.13	0.59	129	.554
Be more alert	2.79	0.96	2.48	1.13	0.32	.30	1.64	129	.103
Feel stronger	2.77	1.04	2.43	1.17	0.34	.31	1.67	129	.097
Sober up quicker	2.12	1.04	1.85	0.96	0.27	.27	1.41	128	.161
Drive a motor vehicle	1.95	1.12	1.30	0.69	0.65	.70	4.04	116	.000**
Be more likely to fight	2.80	1.14	1.80	0.99	1.00	.94	4.82	129	.000**

*$p < .01$, **$p < .001$

Figure Caption

Figure 1. Combined use expectancy risk taking and negative consequence scale items modified to measure combined use.

Figure 2. Men and women alcohol only expectancy risk taking scale items.

1 = Disagree
2 = Slightly Disagree
3 = Slightly Agree
4 = Agree

Risk Taking Variables:

1. I would enjoy sex more	①②③④
6. I would be brave and daring	①②③④
7. I would be courageous	①②③④
8. I would act aggressively	①②③④
14. I would take risks	①②③④
16. I would be more alert	①②③④
17. I would feel stronger	①②③④
22. I would sober up quicker	①②③④
23. I would drive a motor vehicle	①②③④
24. I would be more likely to fight	①②③④

Negative Consequence Variables:

2. I would feel dizzy	①②③④
3. I would be clumsy	①②③④
4. I would be loud, boisterous, or noisy	①②③④
9. I would feel guilty	①②③④
11. I would feel moody	①②③④
18. I would not sleep well	①②③④
20. I would be nervous or jittery	①②③④
25. I would get a hangover	①②③④
26. I would experience a rapid heartbeat	①②③④
27. I would be more likely to get injured	①②③④

From "Brief Comprehensive Effects of Alcohol (B-CEOA)" modified from original version created by L. Ham, S. Stewart, P. Norton, & D. Hope, 2005, Journal of Psychopathology and Behavioral Assessment, 27(3), 141-158.

1 = Disagree
2 = Slightly Disagree
3 = Slightly Agree
4 = Agree

Alcohol Risk Taking Variables:

1. I would enjoy sex more	①②③④
4. I would be loud, boisterous, or noisy	①②③④
6. I would be brave and daring	①②③④
7. I would be courageous	①②③④
8. I would act aggressively	①②③④
14. I would take risks	①②③④
16. I would be more alert	①②③④
17. I would feel stronger	①②③④
23. I would drive a motor vehicle	①②③④
24. I would be more likely to fight	①②③④

From "Brief Comprehensive Effects of Alcohol (B-CEOA)" modified from original version created by L. Ham, S. Stewart, P. Norton, & D. Hope, 2005, Journal of Psychopathology and Behavioral Assessment, 27(3), 141-158. Copyright 2005 by The American Psychological Association. Adapted with permission of the author.

PART THREE

Appendix

EXTENDED LITERATURE REVIEW

The extended literature review section further describes research related to the research investigation. This section contains additional information about: (a) athlete alcohol consumption rates, (b) athlete risk taking behaviors, (c) energy drink studies, combined alcohol and energy drink studies, (d) energy drink ingredients, and (e) expectancy instrument research. Previous research has examined the affects of energy drinks and if the “whole energy drink” has an impact on reducing the depressant effects of alcohol. Prior to the creation of energy drinks, numerous studies were conducted researching how the individual ingredients found within energy drinks interacted with alcohol. Many studies have been conducted to determine if these ingredients in fact reduce the depressant side effects of alcohol. Therefore, to better understand how energy drinks work, previous research on the affects of energy drinks and what ingredients are found in energy drinks are presented in the extended literature review section.

Athlete Alcohol Consumption Rates

Research indicates that the majority of college students consume alcohol, and a considerable percentage of those that drink are binge drinkers (The Core Institute, 1998; Wechsler et al., 1994). Though alcohol use is not confined to any particular subgroup of students, historically alcohol research has focused on various demographics factors such as gender, ethnicity, socioeconomic status, fraternity or sorority affiliation, and intercollegiate athletic status (Humara & Sherman, 1999; Kahler et al., 2003; Meilman et al., 1999; Nelson & Wechsler, 2001; Wechsler et al., 1997). Research indicates that college athletes are more likely to consume larger amounts of alcohol and to drink more frequently than other college students (Nelson & Wechsler, 2001; Wechsler et al., 1997;

Leichliter et al., 1998). Several research studies have consistently shown that athletes exhibit higher rates of alcohol consumption and related consequences. Furthermore, several studies have also indicated that college athletes report higher alcohol use and misuse than non-athletes (Hildebrand et al., 2001; Leichliter et al., 1998; Nelson & Wechsler, 2001; Wechsler et al., 1997).

Leichliter, Meilman, Presley, & Cashin (1998) conducted a survey on 51,483 students from 125 U.S. and found that athletes consumed significantly more alcoholic drinks per week than non-athletes. The researchers categorized the sample by sport non-participant (*N* = 42,734), team member (*n* = 6,651), or team leader (*n* = 2,098). In this survey, athletes averaged 8.25 drinks per week for team leaders and 7.34 for team members, whereas non-athletes averaged 4.12 drinks per week (Leichliter et al., 1998). As a result of abusing alcohol, more athletic team members than non-athletes experienced negative consequences such as hangovers (68% vs. 56%) and driving under the influence (37% vs. 30%). Furthermore, the negative consequences for team leaders were extreme (Leichliter et al., 1998). As athletic involvement increased, results indicated a significant increase in drinking. Athletes also indicated considerably higher rates of binge drinking at 58% for team leaders and 54% team members, versus 36% for non-athletes (Leichliter et al., 1998).

Wechsler, Dowdall, Grossman, and Zanakos (1997) reported similar drinking results, in a study of 17,251 students from 140 U.S. colleges. In this study, respondents were divided into three groups: “those involved in athletics” (*n* = 2,088, spending one hour or more per day in intercollegiate sports and thinking that sport is important, “partially involved in athletics” (*n* = 3,888, spending one or more hours per day in intercollegiate sports or thought participation in sports is important), and “not involved” (*n* = 11,122). For the purposes of this literature review, the results of those involved in athletics and those “not involved”, were examined since one cannot be sure that those only partially involved actually participated in intercollegiate athletics. Results of this study indicated that male and female athletes were significantly more likely to binge drink and to binge more often than those not involved in athletics (Wechsler et al., 1997). Significantly more males involved in intercollegiate athletics binged, or consumed five or more drinks in a row, in the past two weeks than males not involved (61% vs. 43%). Wechsler et al. (1997) also discovered gender differences, with more male athletes reporting binge drinking than female athletes, which is comparable to rates with the general US student population. Twenty-nine percent of males involved in intercollegiate athletics reported bingeing three or more times in the past two weeks, compared to 18% for those not involved. Results indicated a similar pattern for females, with 50% of females involved in intercollegiate athletics bingeing in the past two weeks (consuming 4 or more drinks in a row) compared to 36% of females not involved. Furthermore, 24% of female intercollegiate athletes reported bingeing three or more times in the past two weeks, compared to 15% of those not involved (Wechsler et al., 1997).

Athlete Risk Taking Behaviors

Several research studies have indicated that college athletes participate in more alcohol risk taking behaviors when compared to other college students (Leichliter et al., 1998; Wechsler et al., 1994, 1995, 1997; Nattiv & Puffer, 1991). In 2001, Hildebrand et al., published a study comparing athletes to non-athletes, which indicated that athletes were more prone to engage in alcohol-related risk taking behaviors. In this study, risk taking behaviors were determined by reporting the frequency of sexual intercourse after alcohol use, riding with a driver under the influence, and driving after alcohol consumption. It was noted that drinking and risk taking behaviors increased as athletes entered college.

Research has shown that college athletes are predisposed to have high risk taking personalities (Benjamin et al., 1996; Nattiv & Puffer, 1991; Zuckerman, 1983; 1996). A number of common personality characteristics have been cited to be associated with both college athletic participation and involvement in risk taking behaviors. Some of these characteristics include high levels of sensation seeking, extraversion, and a learned bias to expect optimistic outcomes (Zuckerman, 1971; Kerr; 1991; Jackson & Mathews, 1988; Kane, 1971). Sensation seeking reflects people's optimal level of "arousal" or level of stimulation (Zuckerman, 1979). Zuckerman (1994) defined sensation seeking as "the seeking of varied, novel, complex, and the willingness to take physical, social, legal, and financial risks for the sake of such experience." Research studies have indicated that athletes are high in thrill and adventure seeking personalities and low in inhibition, compared to non-athletes (Zuckerman, 1983, 1996).

Research has also suggested that there is a strong genetic link to sensation seeking personalities in athletes, which is related to brain chemistry and level of arousal. Two researchers, Marvin Zuckerman and C. Robert Cloninger have theorized that the neural circuits in the brain containing the neurotransmitters serotonin, dopamine, and nor-epinephrine (nor-adrenaline) have an influence on sensation seeking (Zuckerman, 1994; Cloninger, 1987). Alcohol and energy drinks both have a large influence on these same neurotransmitters, with both substances causing a large release of these stored mood and arousal regulating hormones (Zuckerman, 1994, 1996; Cloninger, 1987).

Energy Drink Studies

Since its inception, in 1987, Red Bull® has been the most heavily marketed and sold energy drink (Wikipedia, 2007). Possibly for this reason, the main ingredients found within it have also been used in many of the energy drink research studies (Seidl et al., 2000; Warburton et al., 2001; Kennedy & Scholey, 2004a, 2004b; Deixelberger-Fritz et al., 2003; Ferreira et al., 2004a, 2004b, 2006). The main ingredients within Red Bull® are caffeine, taurine, sugar, gluconolactone, inositol, niacin, pantenol, and B-complex vitamins. Researchers have noted a likely synergistic affect when the individual ingredients within energy drinks are mixed together (Deixelberger-Fritz et al., 2003; Scholey and Kennedy, 2004a; 2004b; Ferreira et al., 2006).

Many research studies have been conducted on the traditional main ingredients found in energy drinks (caffeine, taurine, and glucuronolactone), which supports energy drink manufacturers claims of increased performance, endurance, concentration, reaction time, and enhanced mood (Seidl et al., 2000; Warburton et al., 2001; Kennedy & Scholey, 2004a, 2004b; Deixelberger-Fritz et al., 2003). These studies have identified improvements in aerobic and anaerobic performance (Alford et al., 2000), sustained attention and reaction time (Alford et al., 2000; Warburton et al., 2001), driving performance (Reyner and Horne, 2002) and improved alertness (Alford et al., 2000; Warburton et al., 2001; Reyner and Horne, 2002).

Seidl, Peyrl, Nicham, & Hauser (2000) tested caffeine, taurine, and glucuronolactone in capsule form in a double-blind placebo controlled crossover study.

The objective of the study was to examine the effects of these ingredients on cognitive performance and mood at night when subjects were expected to be sleepy (Seidl et al., 2000). Participants were 10 graduate students (4 male, 6 female) ranging from 20-28 years of age. Five subjects were non-caffeine users and 5 were regular caffeine consumers for more than one year (Seidl et al., 2000). Seidl et al. (2000) did address the previous concerns of earlier caffeine studies about the increases in performance and mood possibly being due to an alleviation of caffeine withdrawal symptoms (James, 1997; Rogers & Dernoncourt, 1998) by depriving subjects of caffeine for at least 24 hours prior to testing (Seidl et al., 2000).

To measure cognitive performance, Seidl et al. (2000) used an event-related potential (ERP) recording, where participants had to distinguish between frequent and infrequent stimuli in the form of tones. Subjects were instructed to count the infrequent tones, and to report the total number at the end of the session. Additionally, the researchers measured reaction time by having subjects press a button to the target sound as quickly as possible (Seidl et al., 2000). To make comparisons between the placebo and CTG groups, the researchers calculated mean scores of the P300 wave peak latencies, the baseline-to-peak amplitude of P300, and reaction time in response to the target stimuli (Seidl et al., 2000). A repeated-measures ANOVA was used to measure the effects of caffeine, taurine, and glucuronolactone on P300 amplitude/latency and psychological test parameters (Seidl et al., 2000). In this experiment, the researchers found that response latency and motor reaction time were significantly longer in the placebo group, whereas the energy drink group remained the same (Seidl et al., 2000). The researchers found that the decrements in P300 latency and reaction times, attention task performance and alertness associated with night time testing, were improved in the active condition in comparison to the placebo (Seidl et al., 2000). Thus, the ingredients found within energy drinks were found to enhance cognitive performance and mood when subjects were performing a sustained task.

Many of the past psychopharmacological studies on cognitive performance and mood have used an excessive dose of caffeine, where participants were generally deprived of caffeine for 10 hours or more (Seidl et al., 2000; Wartburton et al., 2001). Seidl et al. (2000) mentioned that improvements in performance could be due to caffeine abstinence, yet they still had volunteers go at least 24 hours without caffeine prior to their study. In response to this, Warburton, Bersellini, & Sweeney (2001) did two similar studies on visual information processing, verbal reasoning, verbal/non-verbal memory, and mood where volunteers went only one hour or less without caffeine prior to testing. Within these two studies, Warburton et al. (2001) also evaluated the affects of glucose on 42 participants who were all regular caffeine users. In both studies the active drink improved participant's accuracy and speed on information processing, reasoning speed, and mood. Results indicated that the beneficial effects of energy drinks were not simply due to the alleviation of caffeine deprivation. Results from both studies showed that the drink containing caffeine and taurine produced improved attention and verbal reasoning when compared to other sugar and sugar free beverages (Warburton et al., 2001). The group that used energy drinks showed more correct answers on cognitive tests and faster reaction times (Warburton et al., 2001). The researchers concluded that drinks containing caffeine and taurine can cause improvements in information processing in individuals who have not been deprived of caffeine (Warburton et al., 2001).

Smit & Rogers (2002) continued research on energy drinks effects on mood and mental performance and designed their study aiming to account for variations in data on previous research studies. To control for possible problems, Smit & Rogers (2002) made two new energy drinks and compared the behavioral effects of two drinks with a still water condition and "no-treatment" condition. Both energy drinks contained the same concentration of glucose and caffeine. In their experiment, participants were tested once per week for five weeks after completing a tiring mental task. No baseline differences were found between treatments. In comparison to water, no effects of the two active treatments were found on either memory or rapid visual information processing. Results indicated no week by treatment interactions between mood and performance (Smit & Rogers, 2002). However, both energy drinks showed significant improvements on reaction time and participants ratings of increased energy and alertness (Smit & Rogers, 2002).

Reyner & Horne (2001, 2002) conducted research on energy drinks ability to counteract driver sleepiness. The researchers compared the effects of a popular energy drink with a very similar tasting control that did not contain caffeine, taurine, or glucuronolactone. After being restricted to 5 hours of sleep the previous night, drivers were tested for 2 hours under monotonous afternoon driving conditions. Subject's lane drifting, subjective sleepiness and electroencephalogram (EEG) measurements were monitored throughout. There was a trend for the EEG measurements to match the driver's perceptions of sleepiness. For the first 90 minutes of the test, energy drinks improved driving performance by significantly reducing driver sleepiness and driving incidents (Reyner & Horne, 2001, 2002). The researchers concluded that energy drinks are beneficial in reducing sleepiness and sleep related driving incidents (Reyner & Horne, 2001, 2002).

Deixelberger-Fritz, Tischler, & Kallus (2003) continued previous energy drink research by examining changes in performance, mood state and workload in pilots after the consumption of energy drinks. In the Deixelberger-Fritz et al. study, 24 airplane pilots and 8 non-pilots participated in a randomized double-blind crossover study on performance changes in two fatiguing 6 hour testing sessions. All participants were moderate users of caffeine ranging from drinking 3-6 cups of coffee per day. Participants were tested in the early evening hours on two different days without caffeine deprivation (Deixelberger-Fritz et al., 2003). Results indicated that participants performed “markedly better” on a continuous performance task and had quicker reaction times when they used Red Bull® compared to when they used the placebo. The placebo was a closely comparable tasting drink that also contained glucose and vitamins (Deixelberger-Fritz et al., 2003). Results showed that subjects had improvements in subjective mood states when they used the energy drink compared to the placebo drink which did not contain caffeine or taurine (Deixelberger-Fritz et al., 2003). This added additional support to previous research on the effects of Red Bull® energy drink on improved performance and mood (Seidl et al., 2000; Warburton et al., 2001; Smit & Rogers, 2002; Horne & Reyner, 2002). In accordance with results found by Horne and Reyner (2002), this study showed a clear positive effect on attention after Red Bull® was consumed (Deixelberger-Fritz et al., 2003). According to Deixelberger-Fritz et al. (2003), “Clear-cut positive effects of the energy drink could be demonstrated on choice reaction time and on performance on a concentration test” (p. 195). The effects of Red Bull® lasted for more than two hours after consumption (Deixelberger-Fritz et al., 2003). Deixelberger-Fritz et al. suggested that “the long lasting positive effect on performance can hardly be explained by the small 80 mg dose of caffeine” (p. 195) and that the other ingredients within energy drinks such as taurine have additional positive effects on performance.

Scholey & Kennedy (2004a) continued to further examine the cognitive and physiological effects of energy drinks. Specifically, the researchers focused on further examining the effects of the combination of glucose and caffeine within the whole energy drink. The researchers used a randomized, double-blind, balanced, five-way crossover design where 20 participants were fasted and caffeine deprived overnight. Unlike previous studies, participants consumed additional ingredients within a 250 ml energy drink such as ginseng and ginkgo biloba (Scholey & Kennedy, 2004a). Results indicated that the whole energy drink resulted in significant improvements in “secondary memory” and “speed of attention”, but there were no other noticed effects on cognitive performance or mood (Scholey & Kennedy, 2004a). The findings suggest that there is a synergistic effect when caffeine and glucose are combined, since these results would not typically be seen when these ingredients are administered in isolation (Scholey & Kennedy, 2004a).

Scholey & Kennedy (2004b) continued to examine their previous research by performing two more double-blind, placebo-controlled, cross-over studies additional studies on the interaction of glucose and caffeine. Within these studies, the researchers concluded that glucose and caffeine can “ameliorate” subjective performance deficits during a prolonged cognitive demand (Scholey & Kennedy, 2004b). In the first study (n=30) participants received low doses of glucose and caffeine (68 g/38 mg and 68g/46 mg, respectively). In the second study, (*n* = 26) participants received a drink containing 60 grams of carbohydrate and 33 mg of caffeine. In each of the three active energy drink treatments there was greater accuracy on the rapid visual information processing task versus the respective placebo drinks (Scholey & Kennedy, 2004b). Thus, confirming that a drink containing glucose and caffeine can improve vigilance during extended periods of high cognitive demand (Scholey & Kennedy, 2004b).

Combined Alcohol and Energy Drink Studies

Many studies have been conducted on the individual ingredients of caffeine (Liguori & Robinson, 2001; Fudin & Nicastro, 1988; Jain et al., 1999) and taurine (Olive, 2002; Ward et al., 2001) when combined with alcohol. However, few have examined the effects of all of these ingredients found within the whole energy drink when combined with alcohol (Ferreira et al., 2006, 2004a, 2004b). To date, in the literature, there is little scientific evidence of the effects of energy drinks on alcohol metabolism and human functioning (Ferreira et al., 2006, 2004a, 2004b). Three main experiments have been conducted on the affects of Red Bull® combined with alcohol in humans. These experiments were conducted by a team of Brazilian researchers from the Federal University of Sao Paulo (Ferreira et al., 2006, 2004a, 2004b, 2004c).

Ferreira, Mello, & Souza-Formigoni (2004a) were the first to examine combined users perceived effects of energy drinks and alcohol. In their study "*Can energy drinks affect the effects of alcoholic beverages? A study with users*" the sample consisted of 136 volunteers aged 24 ± 6 years, who had reported at least one previous use of energy drinks. Volunteers answered a questionnaire on their pattern of use of energy drinks and alcoholic beverages. The majority of the sample (76%) reported combining energy drinks with alcohol. 79% of the sample also reported using energy drinks alone. Out of those who combined alcohol and energy drinks, 14% reported feeling no difference, 38% increase in happiness, 30% euphoria, 27% uninhibited behavior, 24% increase of physical vigor, and 11% experienced insomnia. The researchers found a high variability in the number of lifetime uses of energy drinks (14 ± 16), but there was a consistency in the number of cans ingested per occasion (1.5 ± 0.7). The researchers concluded that the effects of energy drinks are variable, most likely depending on the dose used and individual sensitivity (Ferreira et al., 2004a).

Ferreira, Mello, Rossi, & Souza-Formigoni (2004b) performed the first scientific study on the effects of energy drinks on the metabolism of alcohol. In their study "*Does an energy drink modify the effects of alcohol in a maximal effort test?*" the researchers examined whether an energy drink would modify the effects of alcohol in a maximal effort cycle ergometer test on 14 male participants. In comparison to the control group, the peak oxygen uptake of volunteers was 5% lower with alcohol alone versus 2.7% for the alcohol and energy drink treatment. No significant differences were detected between the alcohol and combined use treatment group. Compared to the control session, lactate and nor-adrenaline levels were higher in the alcohol only and alcohol with energy drink sessions (Ferreira et al., 2004b, pp. 1409-1410). Volunteers who received 1.0 g/kg of alcohol plus energy drink showed no improvement in the cycle ergometer test. At the low tested doses, no significant differences in heart rate, energy expenditure, respiratory exchange rate, blood lactate, or nor-adrenaline levels were detected between the alcohol only and alcohol plus energy drink groups (Ferreira et al., 2004b, pp. 1409-1410). The researcher's concluded that their "findings suggest that small doses of Red Bull® do not improve cycling performance or reduce alterations after acute alcohol ingestion" (Ferreira et al., 2004b, p. 1408).

Ferreira, Mello, Pompe´ia, & Souza-Formigoni (2006) continued their research on the effects of energy drink consumption on alcohol. Their research study, "*Effects of energy drink ingestion on alcohol intoxication*" investigated whether energy drinks reduce the depressant effects of alcohol. In this experiment Ferreira et al. (2006) used small doses of alcohol and energy drinks and measured participants breath alcohol concentration, subjective sensations of alcohol intoxication, objective effects on coordination, and visual reaction time (Ferreira et al., 2006, pp. 599-602). Twenty-six male volunteers between the ages of 20 and 26 that were moderate drinkers (less than 14 doses per week) and moderate users of energy drinks (fewer than 10 cans of 250 ml in the last 6 months) participated in the study. The energy drink was administered at 3.57 ml/kg, which is equivalent to one can for a 70-kg person. Vodka at 37.5% v/v was administered to twelve randomly assigned volunteers at doses of .6 g/kg and fourteen at 1.0 g/kg. This equals about 2.5 and 4 standard alcoholic drinks for the two groups along with 1 can of energy drink (Ferreira et al., 2006, p. 599). Motor coordination and visual reaction time were tested before alcohol ingestion, 30 minutes, and 120 minutes after consumption. To measure fine motor coordination, the Grooved Peg-board test was used where participants fit pegs into 25 holes. Visual reaction time was tested using a well known computer software program (Ferreira et al., 2006, p. 600).

The ingestion of one Red Bull® in this study showed a reduction in the intensity of some subjective symptoms of alcohol intoxication, but did not reduce the deficits evaluated by objective tests (Ferreira et al., 2006). After combined ingestion of alcohol and energy drink, volunteers reported fewer intoxication symptoms such as headache, weakness, and motor coordination versus alcohol alone (Ferreira et al., 2006, pp. 600-602). However, the ingestion of the energy drink did not alter participant's breath alcohol concentration, or significantly reduce decrements in motor coordination and visual reaction time (Ferreira et al., 2006, pp. 600-602). Although with the low doses of the energy drink being tested, it is possible that higher doses could counteract the effects of alcohol (Ferreira et al., 2006, p. 603).

In the study, "Can energy drinks reduce the depressor effect of ethanol? An experimental study in mice" Ferreira, Quadros, Trindade, Takahashi, Koyama, & Souza-Formigoni (2004c) showed that an energy drink dose equivalent to three times the amount used in the Ferreira et al. (2006) experiment did have a significant affect on locomotor activity. Considering that newer energy drinks such as "Burn2®, Rockstar®, and Cocaine®" contain roughly 3 times the amount of caffeine with the combination of caffeine and guarana equaling roughly 250-280 mg compared to the 80 mg of caffeine found in Red Bull®, this is an important future consideration. The results from the Ferreira et al. (2006) study indicate a considerable difference between subjects' sensations of tiredness and sleepiness, and actual capabilities (pp. 600-602). Therefore, it is important to further examine the combined use of energy drinks and alcohol as it may lead to an increase in risk taking behaviors such as drinking and driving and increased alcohol consumption (Ferreira et al., 2006. pp. 603-604).

The results of studies by Ferreira et al. (2004b, 2006) suggest that the combined use of alcohol and energy drinks can impair a users judgement of their level of alcohol intoxication. These studies come to agreement with the only other case report found in the literature on the interaction of alcohol and energy drinks. Riesselmann et al. (1996) suggested that the combined use of alcohol and energy drinks could impair the judgment of users, causing them to perceive a reduced sensation of intoxication, thus increasing the probability of drivers being involved in accidents. To the researcher's knowledge, Red Bull® has been the only energy drink thus far tested in conjunction with alcohol (Ferreira et al., 2004a, 2004b, 2004c, 2006).

Energy Drink Ingredients

Laboratory animal studies have shown an interaction between ethanol and some of the components of energy drinks such as taurine (Aragon et al., 1992; Dahchour et al., 1996; Martin-Algarra et al., 1998) and caffeine (Kuribara et al., 1992; Koo, 1999; Kunin et al., 2000; Liguori & Robinson, 2001). The main ingredients found Red Bull® are caffeine, taurine, sugar, gluconolactone, inositol, niacin, pantenol, and B-complex vitamins. Prior to the production of energy drinks, the effects of some of the ingredients found within energy drinks were evaluated for their effects on alcohol intoxication and metabolism (Ferreira et al., 2006). Prior research has also shown that sugars such as glucose and fructose have a limited effect on reducing alcohol intoxication (de Souza et al., 1982**;** Levy et al., 1977; Zacchia et al., 1991). Many of the vitamins found within energy drinks, especially B-vitamins, have also been evaluated and have shown to have a slight antagonizing affect on alcohol intoxication (Kelly et al., 1971**;** Moretti et al., 1969; Muir et al., 1973). Caffeine, taurine, glucose, and other ingredients will be discussed in greater detail in the following paragraphs.

Caffeine. In previous research studies, caffeine users have reported increased alertness and wakefulness and that their ability to work and concentrate is enhanced

(Zwygheuizen-Doorenbos et al., 1990; Griffiths & Mumford, 1994; Smit & Rogers, 2000, 2002; Warburton et al., 2001; Scholey & Kennedy, 2004a; 2004b). The literature pertaining to caffeine has reported several psychological and performance benefits. Caffeine alone has been shown to decrease reaction time (Lieberman et al., 1987; Kerr et al., 1991) and to enhance attentional processing of information (Smith et al., 1990; Frewer & Lader, 1991; Warburton, 1995). Early studies on caffeine used high doses exceeding 250 mg (Battig & Buzzi, 1986), and it has been shown that doses exceeding 500 mg are dangerous to users (Hasenfratz & Battig, 1994). Consequently, many studies have been performed with lower doses of caffeine, which would be more similar to the amounts found in many energy drinks (Durlach, 1998; Hindmarch et al., 1998; Smit & Rogers, 2000). Even when used in low doses, caffeine can improve performance by reducing reaction times and improving attention (Warburton, 1995; Koelega, 1998; Smith, 2000, 2002). Performance enhancement can generally be seen across sustained psychomotor and vigilance tasks (Scholey & Kennedy, 2004b). Furthermore, caffeine is also consistently associated with improvements in mood by reducing fatigue and increasing alertness (Smith, 2002; Scholey & Kennedy, 2004a). When examining human risk-taking behaviors associated with drinking alcohol, caffeine could have a significant impact on the amount of alcohol consumed (Ferreira et al., 2006, p. 604 discussion). Animal studies suggest that caffeine can increase voluntary consumption and the stimulant properties of low doses of alcohol (Koo, 1999; Kunin et al., 2000; Kuribara et al., 1992; Waldeck, 1974).

Previously, caffeine has been used in the treatment of moderate intoxication of depressants (DeLucia & Oliveira-Filho, 2004). The amount of caffeine in most standard 8 ounce energy drinks is only 80 mg, which is not enough to justify its reported antagonistic effects on alcohol (Ferreira et al., 2006). Laboratory work outside of the field of driving has shown that caffeine in moderate does of 150-200 mg significantly improves alertness in sleep deprived subjects (Lumley et al., 1987; Griffiths et al., 1990; Lorist et al., 1994; Bonnet & Arand, 1994; Muehlbach & Walsh, 1995; Akerstedt & Ficca, 1997). However, energy drink studies with replicate designs from previous caffeine models have indicated that energy drinks with only 80 mg of caffeine reduce brake reaction time and perceived driver sleepiness (Horne & Reyner, 2001). Furthermore, there seems to be a synergistic stimulant effect when the ingredients within energy drinks are combined. Other driving studies with just caffeine have indicated that high doses can partially antagonize the depressant effects of alcohol intoxication, but will not completely counteract alcohol impairment (Liguori & Robinson, 2001). These doses are typically high at 400 mg and above, which could potentially cause complications for the user at this dosage (Liguori & Robinson, 2001). Due to variables such as individual tolerance, researchers have been unable to reach a consensus on the dose of caffeine necessary to reduce the depressor effects of alcohol. Additionally, most of these studies gauge the effects of caffeine on alcohol specifically on tests of locomotor performance (Fudin & Nicastro, 1988; Jain et al., 1999).

Taurine. Taurine is thought to have a significant effect on alcohol metabolism. Taurine is one of the most abundant amino acids found naturally in the central nervous system and it has several important functions in physiological processes such as osmoregulation, neuroprotection, and neuromodulation (Olive, 2002). Animal studies have shown significant interactions between taurine and ethanol on locomotor activity, the release of dopamine, and taurine reducing the effects of ethanol on liver metabolism (Aragon et al., 1992; Dahchour et al., 1996; Kerai et al., 1998). Taurine can alter the locomotor stimulatory, sedating, and motivational effects of ethanol in a strongly dose-dependent manner (Olive, 2002; Quertemont et al., 1998). Taurine and ethanol both exert "positive allosteric modulatory effects" on GABA (an inhibitory neurotransmitter similar to the chemical structure of ethanol) and glycine receptors, and inhibitory effects on N-methyl-D-asparatate (NMDA) and positive calcium (Ca2+) channels (Olive, 2002). This suggests that taurine has an inhibitory or regulating effect on the central nervous system and can help stabilize heart rate when used with stimulants. Microdialysis studies have shown that ethanol raises extracellular levels of taurine in numerous brain regions (Olive, 2002). In a study on mice, Vohra & Hui (2000) showed that taurine can be effective in reducing the symptoms of amnesia induced by alcohol without compromising other behavioral aspects. The interaction of taurine and ethanol on human cognitive performance is still unknown (Olive, 2002; Ferreira et al., 2006). Research on taurine suggests that our body's "endogenous" or natural taurine system could be an important modulator of the effects of ethanol on the nervous system, and it may be beneficial to the development of future medications to treat alcoholism (Olive, 2002).

Glucose. Unlike most carbonated beverages, energy drinks directly contain glucose. An effect of alcohol metabolism is that it causes users to become hypoglycemic due to alcohol inhibiting the livers ability to convert carbohydrates into glucose while alcohol is present in the blood (Freinkel & Ronald, 1966; Freinkel et al., 1988). Some of the side effects of alcohol induced hypoglycemia include problems with thinking and memory, brain damage, dizziness, clumsiness, rapid heartbeat, and difficulty sleeping.

Alcohol induced hypoglycemia is a significant contributor the hangover symptoms caused by alcohol (Freinkel et al., 1988). Since most energy drinks already contain glucose, the body's liver does not have to convert carbohydrates into glucose, which is important, since ethanol metabolism reduces the livers ability to regulate blood glucose levels when ethanol is present (Freinkel et al., 1988). Although, it would seem that glucose is not a stimulant, glucose ingestion has been associated with an acceleration of heart rate (Kennedy & Scholey, 2000; Ford et al., 2002). The direct administration of glucose does have an effect on cognitive performance and the metabolism of ethanol, partially due to it counteracting alcohols hypoglycemic effect of lowering blood glucose levels (Kennedy and Scholey, 2000; Ford et al., 2002). Previous research has well documented that aspects of psychological performance can be enhanced by the consumption of drinks containing 25-50 grams of glucose (Scholey & Kennedy, 2004a; 2004b). Research has shown several improvements in cognitive tasks including enhancement of memory (Foster et al., 1998; Sunram-Lea et al., 2002), reaction times (Owens & Benton, 1994), rapid visual information processing (Benton et al., 1994; Donohoe & Benton, 1999), working memory (Martin & Benton, 1999), driving simulator performance (Keul et al., 1982), and improving kinesthetic performance (Scholey & Fowles, 2002). Scholey & Kennedy (2004b) found that when caffeine and glucose were combined in a "whole energy drink" compared to a placebo it resulted in significantly improved performance on "secondary memory" and "speed of attention" which would not be predicted from the effects of these ingredients individually. Suggesting that there is a synergistic affect when caffeine and glucose are combined (Scholey & Kennedy, 2004b).

Vitamins/Herbals. The effects of caffeine, taurine, and sugars on alcohol have been studied extensively, but little research exists on many of the other ingredients found in energy drinks. Research on the B-vitamins has shown that they increase energy metabolism (McArdle et al., 1996). The B complex vitamins found within energy drinks have also been evaluated on their physiological and psychological effects on alcohol intoxication, and have shown to have a slight antagonizing effect on ethanol (Kelly et al., 1971; Moretti et al., 1969; Muir et al., 1973). Kelly et al., (1971) found that intravenous B-vitamins induced significantly improved performance and reduced alcohol intoxication.

Ginseng is another stimulant compound that is being used more commonly in beverages and in several different brands of energy drinks. Research on ginseng, indicates that ginseng likely reduces the sedative effects of ethanol, due to its stimulating affects on the central nervous system (Koo, 1999). In animal research by Koo (1999), ginseng was found to reduce blood alcohol concentration, which was suggested to be "partially due to ginseng slowing gastric emptying" (Koo, 1999, p. 153). In the Division I athlete supplement survey by Froiland et al. (2004), 13% reported using ginseng, with male athletes showing a significant intake of ginseng. Another very interesting ingredient that is now being found in some energy drinks such as Sobe Adrenaline Rush® is creatine. Froiland et al. (2004) found that 37.2% of athletes reported using creatine.

Additional Expectancy Instrument Research

Expectancies are important in understanding drinking behavior, and can provide direction for problem drinking prevention and intervention (Ham et al., 2005). Given their importance on influencing drinking behaviors, it is crucial that alcohol expectancies are adequately assessed (Ham et al., 2005). The most widely used alcohol outcome expectancies measure has been the Alcohol Expectancy Questionnaire (Brown et al., 1980), which assesses six distinct positive expectancies of using alcohol. In the past, the AEQ and other similar expectancy measures have been criticized for neglecting to assess negative expectancies/undesirable effects and perceived valuations/whether an individual perceives the effect as good or bad (Adams & McNeil, 1991; Fromme et al., 1993; Leigh, 1989). In order to address both of these criticisms, the Comprehensive Effects of Alcohol questionnaire (CEOA) was developed (Fromme et al., 1993). Therefore, the CEOA includes items addressing both positive and negative expectancies, and subjective valuations of possible consequences of drinking alcohol. Positive expectancies have been studied considerably more than negative expectancies, and have typically been associated with increased and problem drinking (Brown, 1985; Fromme et al., 1993). In previous studies where participant's subjective valuations were not used, the connection between negative expectancies and drinking behavior has been less clear (Cox, 1993; Miller, 1985). Using the CEOA, Fromme et al. (1993) and Valdivia and Stewart (2005) found that negative expectancies predicted lower consumption of alcohol.

Expectancies have been studied more than valuations of ethanol's effects (Ham et al., 2005). According to Bandura's (1977) classic expectancy theory, an outcome expectancy will only increase behavior if a person desires or values the expected outcome. Since heavy drinkers view the negative effects of alcohol as less significant than light drinkers (Williams & Ricciardelli, 1996), negative expectancies have a lower impact on preventing drinking (Ham et al., 2005). People's valuations of alcohol's effects have been found to increase the predictive ability and usefulness of expectancies of alcohol use (Leigh, 1987; Valdivia & Stewart, 2005). Valuations have also successfully been used as an independent predictor of post treatment abstinence for alcoholics (Jones & McMahon, 1996). According to Ham, Stewart, Norton, & Hope (2005) valuations may be the missing answer to account for previous discrepancies in positive and negative expectancy research. Research by Fromme & D'Amico (2000) indicated that subjective valuations of alcohol's effects may be more important predictors for the so-called "negative" expectances than positive expectancies in predicting alcohol use. In another study, Werner, Walker, & Greene (1993) found that positive expectancies and positive valuations of "negative" outcomes were significant independent predictors of alcohol consumption and related health problems. Ham et al. (2005) found that both negative expectancies and valuations are important constructs in addition to focusing on positive expectancies.

References

Adams, S. L., & McNeil, D. W. (1991). Negative alcohol expectancies reconsidered. *Psychology of Addictive Behaviors*, 5, 9-14.

Addictive Behaviors Research Center. (1997). *The alcohol skills training program facilitators manual.* Unpublished manual, Psychology Department, University of Washington.

Alford, C., Cox, H., & Wescott, R. (2001). The effects of red bull energy drink on human performance and mood. *Amino Acids*, 21, 139-150.

Aragon, C. M., Trudeau, L. E., & Amit, Z. (1992). Effect of taurine on ethanol induced changes in open-field locomotor activity. *Psychopharmacology (Berlin)*, 107(2-3), 337-340.

Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice-Hall.

Battig, K., & Buzzi, R. (1986). Effect of coffee on the speed of subject-paced, rapid information processing. *Neuropsychobiology*, 16, 126-130.

Bauer, L., & Smith, J. (2006, October 26). Juicy jolts or risky sips? *The Kansas City Star*, pp. A1, A4.

Benjamin, J., Li, L., Patterson, C., Greenberg, B. D., Murphy, D., & Hamer, D. (1996). Population and familial association between the D4 dopamine receptor gene and measures of novelty seeking. *Nature Genetics*, 12, 81-84.

Brown, S. A. (1985). Expectancies versus background in the prediction of college drinking patterns. *Journal on Consulting and Clinical Psychology*, 53(1), 123-130.

Brown, S. A., Goldman, M., Inn, A., & Anderson, L. (1980). Expectations of reinforcement by alcohol: Their domain and relation to drinking patterns. *Journal of Consulting and Clinical Psychology*, 48, 419-426.

Bunsen, N. (1991). Development of an adolescent risk-taking instrument. *Journal Child Practical Nursing*, 4(4), 143-149.

The Core Institute. (1998). Recent statistics on alcohol and other drug use on American college campuses: 1995-1996. (1998). Carbondale, IL.

Carey, K. B., & Correia, C. J. (1997). Drinking motives predict alcohol-related problems in college students. *Journal of Studies on Alcohol*, 58, 100-105.

Clark, D., Sommerfeldt, L., Schwarz, M., Hedeker, D., & Watel, L. (1990). Physical recklessness in adolescence trait or byproduct of depressive/suicidal states? *The Journal of Nervous Mental Disease*, 178(7), 423-433.

Cox, W. M., Klinger, E., & Blount, J. P. (1993). Alcohol use and goal hierarchies: Systematic motivational counseling for alcoholics. In W. R. Miller & S. Rollnick (Eds.), Motivational interviewing: Preparing people to change addictive behavior (pp. 361-371). New York: Guilford Press.

Dahchour, A., Quertemont, E., & De Witte, P. (1996). Taurine increases in the nucleus accumbens microdialysate after acute ethanol administration to naive and chronically alcoholised rats. *Brain Research,* 73(5), 9-19.

de Souza, M. L. O., Laranjeira, R. R., & Masur, J., (1982). Glucose administration in acute alcoholic intoxication. A double-blind study in volunteers. *AMB; Revista Da Associacao Medica Brasileira,* 28, 171-173.

Deixelberger-Fritz, D., Tischer, M. A., & Wolfgang, K. K. (2003). Changes in performance, mood state and workload due to energy drinks in pilots. *International Journal of Applied Aviation Studies,* 3(2), 195-205.

Dimeff, L. A., Baer, J. S., Kivlahan, D. R., & Marlatt, G. A. (1999). *Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach.* New York: Guilford Press.

Durlach, P. J. (1998). The effects of a low dose of caffeine on cognitive performance. *Psychoopharmacology*, 140, 116-119.

Engs, R. C. & Hanson, D. J. (1985). The drinking patterns and problems of college students: 1983. *Journal of Alcohol and Drug Education,* 31(l), 65-83.

Ferreira, S. E., Mello, M. T., Pompe´ia, S., & Souza-Formigoni, M. L. O. (2006). Effects of energy drink ingestion of alcohol intoxication. *Alcoholism: Clinical and Experimental Research,* 30(4), 598-604.

Ferreira, S. E., Mello, M. T., & Souza-Formigoni, M. L. O. (2004a). Can energy drinks affect the effects of alcoholic beverages? A study with users. *Revista Da Associacao Medica Brasileira*, 50, 48-51.

Ferreira, S. E., Mello, M. T., Rossi, M. V., & Souza-Formigoni, M. L. O. (2004b). Does an energy drink modify the effects of alcohol in a maximal effort test? *Alcohol Clinical Experimental Research*, 28, 1408-1412.

Ferreira, S. E., Quadros, I. M. H., Trindade, A. A., Takahashi, S., Koyama, R. G., & Souza-Formigoni, M. L. O. (2004c). Can energy drinks reduce the depressor effect of ethanol? An experimental study in mice. *Physiology of Behavior*, 82, 841-847.

Ford, C.E., Scholey, A.B., Ayre, G., Wesnes, K. (2002). The effect of glucose administration and the emotional content of words on heart rate and memory. *Journal of Psychopharmacology*, 16, 241-244.

Fudin, R., & Nicastro, R. (1988). Can caffeine antagonize alcohol-induced performance decrements in humans? *Perceptual Motor Skills*, 67, 375-391.

Freinkel, N., & Arky, R.A. (1966). Effects of alcohol on carbohydrate metabolism in man. *Human Behavior & Biology*, 27(4), 551-563.

Freinkel, N., Singer, D. L., Arky, R. A., Bleicher, S. J., Anderson, J. B., Silbert, C. K. (1988). Journal of Clinical Investigation, April; 81(4): 1137–1145.

Froiland, K., Koszewski, W., Hingst, J., & Kopecky, L. (2004). Nutritional supplement use among college athletes and their sources of information. *International Journal of Sport Nutrition & Exercise Metabolism*, 14(1), 104-20.

Fromme, K., & D'Amico, E. J. (2000). Measuring adolescent alcohol expectancies. *Psychology of Addictive Behaviors*, 14(2), 206-212.

Fromme, K., Stroot, E., & Kaplan, D. (1993). Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. *Psychological Assessment*, 5(1), 19-26.

Graham, T. E. (2001). Caffeine and exercise metabolism, endurance and performance. *Sports Medicine*, 31(11), 785-807.

Green, A., Uryasz, F., Petr, T., & Bray, C. (2001). NCAA study of substance use and abuse habits of college student athletes. *Clinical Journal of Sport Medicine*, 11, 51-56.

Griffiths, R. R., & Mumford, G. K. (1994). Caffeine – a drug of abuse? In F. E., Bloom & D. J., Kupfer (Eds.), *Psychopharmacology: The fourth generation of progress* (pp. 1699-1713). New York: Raven Press.

Ham, L. S., Stewart, S. H., Norton, P. J. & Hope, D. A. (2005). Psychometric assessment of the comprehensive effects of alcohol questionnaire: Comparing a brief version to the original full scale. *Journal of Psychopathology and Behavioral Assessment*, 27(3), 141-158.

Hasenfratz, M., & Battig, K. (1994). Acute dose-effect relationships of caffeine and mental performance, EEG, cardiovascular and subjective parameters. *Psychopharmacology*, 114, 281-287.

Hildebrand, K., Johnson, D., & Bogle, K. (2001). Comparison of patterns of alcohol use between high school and college athletes and non-athletes. *College Student Journal*, 35, 358-365

Hindmarch, I., Quinlan, P. T., Moore, K. L., & Parkin, C. (1998). The effects of black tea and other beverages on aspects of cognition and psychomotor performance. *Psychopharmacology*, 139, 230-238.

Horne, J. A., & Reyner, L. A. (2001). Beneficial effects of an "energy drink" given to sleepy drivers. *Amino Acids*, 20, 83-89.

Horvath, P. & Zuckerman, M. (1993). Sensation seeking, risk appraisal, and risky behavior. *Personality and Individual Differences*, 16, 109-125.

Humara, M., & Sherman, M. (1999). Situational determinants of alcohol abuse among Caucasian and African-American college students. *Addictive Behaviors*, 24, 135-138.

Irmak, C., Block, L. G., & Fitzsimons, G. J. (2005). The placebo effect in marketing: sometimes you just have to want it to work. *Journal of Marketing Research*, XLII, 406-409.

Jackson, C. & Matthews, G. (1988). The prediction of habitual alcohol use from alcohol related expectancies and personality. *Alcohol & Alcoholism*, 23(4), 305-314.

Jain, A. C., Mehta, M.C., & Billie, M. (1999). Combined effects of caffeine and alcohol on hemodynamics and coronary artery blood flow in dogs. *Journal of Cardiovascular Pharmacology*, 33, 49-55.

James, J. E. (1997). Understanding caffeine: A biobehavioral analysis. Behavioral Medicine and Health Psychology Series. California: *Sage Publications*.

Jones, B. T., & McMahon, J. (1996). A comparison of positive and negative alcohol expectancy and value and their multiplicative composite as predictors of post-treatment abstinence survivorship. *Addiction*, 91(1), 89-99.

Kahler, C., Read, J., Wood, M., & Palfai, T. (2003). Social environmental selection as a mediator of gender, ethnic, and personality effects on college student drinking. *Psychology of Addictive Behaviors*, 17, 226-234.

Kane, J. (1971). Personality, arousal, and performance. *International Journal of Sport Psychology*, 2(1), 338-346.

Kassel, J.D., Jackson, S.I. & Unrod, M. (2000). Generalized expectancies for negative mood regulation and problem drinking among student athletes. *Journal of Studies on Alcohol*, 61, 332-340.

Kelly, M., Myrsten, A.L., Goldberg, L. (1971). Intravenous vitamins in acute alcoholic intoxication: effects on physiological and psychological functions. *Brazil Journal Addiction of Alcohol and Other Drugs*, 66, 19-30.

Kennedy, D.O., Scholey, A.B. (2000). Glucose administration, heart rate and cognitive performance: effects of increasing mental effort. *Psychopharmacology*, 149, 63-71.

Kennedy, D.O., Scholey, A.B. (2004a). Cognitive and physiological effects of an “energy drink”: an evaluation of the whole drink and of glucose, caffeine and herbal flavouring fractions. *Psychopharmacology*, 176: 320-330.

Kennedy, D.O., Scholey, A.B. (2004b). A glucose-caffeine ‘energy drink’ ameliorates subjective and performance deficits during prolonged cognitive demand. *Appetite*, 42, 331-333.

Kerai, M.D., Waterfield, C.J., Kenyon, S.H., Asker, D.S., Timbrell, J.A. (1998). Taurine: protective properties against ethanol-induced hepatic steatosis and lipid peroxidation during chronic ethanol consumption in rats. *Amino Acids*, 15, 53-76.

Kerr, J. (1991). Arousal-seeking in risk sport participants. *Personality and Individual Differences*, 12(6), 613-616.

Kerr, J. S., Sherwood, N., & Hindmarch, I. (1991). Separate and combined effects of social drugs on psychomotor performance. *Psychopharmacology*, 104, 113-119.

Koelega, H. S. (1998). Effects of caffeine, nicotine and alcohol on vigilance performance. In J. Snel, & M. M. Lorist (Eds.), Nicotine, caffeine and social drinking: Behavior and brain function (pp. 363-373). Amsterdam, Netherlands: Hardwood Academic Publishers.

Koo, M. W. (1999). Effects of ginseng on ethanol induced sedation in mice. *Life Science*, 64, 153-160.

Kunin, D., Gaskin, S., Rogan, F., Smith, B. R., & Amit, Z. (2000). Caffeine promotes ethanol drinking in rats. Examination using a limited-access free choice paradigm. *Alcoholism*, 21, 271-277.

Kuribara, H., Asahi, T., Tadakoro, S. (1992). Ethanol enhances, but diazepam and pentobarbital reduce the ambulation-increasing effect of caffeine in mice. *Arukoru Kenkyuto Yakubutsu Ison*, 27, 528-539.

Lecci, L., MacLean, M.G. & Croteau, N. (2002). Personal goals as predictors of college student drinking motives, alcohol use and related problems. *Journal of Studies on Alcohol*, 63, 620-630.

Leigh, B. C. (1987). Evaluations of alcohol expectancies: Do they add up to the prediction of drinking patterns? *Psychology of Addictive Behaviors*, 1, 135-139.

Leigh, B. C. (1989). In search of the seven dwarves: Issues of measurement and meaning in alcohol expectancy research. *Psychological Bulletin*, 105(3), 361-373.

Leigh, B. C. (1990). The relationship of sex-related alcohol expectancies to alcohol consumption and sexual behavior. *Addiction*, 85(7), 919–928.

Leichliter, J. S., Meilman, P. W., Presley, C. A., & Cashin, J.R. (1998). Alcohol use and related consequences among students with varying levels of involvement in college athletics. *Journal of American College Health*, 46, 257-262.

Lieberman, H. R., Wurtman, R. J., Emde, G. G., Roberts, C., & Coviella, I. L. G. (1987). Effects of low doses of caffeine on human performance and mood. *Psychopharmacology*, 92, 308-312.

Levy, R., Elo, T., & Hanenson, I. B., (1977). Intravenous fructose treatment of acute alcohol intoxication. Effects on alcohol metabolism. *Archives of International Medicine*, 137, 1175-1177.

Liguori, A., & Robinson, J. H. (2001). Caffeine antagonism of alcohol-induced driving impairment. *Drug and Alcohol Dependence*, 63(2), 123-129.

McArdle, W. D., Katch, F. I., Katch, V. L. (1996). *Exercise physiology: Energy, nutrition and human performance (4th ed.)*. Baltimore: Lippincott Williams & Wilkins.

Martens, M. P., Cox, R. H. & Beck, N. C. (2003). Negative consequence of intercollegiate athlete drinking: The role of drinking motives. *Journal of Studies on Alcohol*, 64, 825-828.

Martin-Algarra, R. V., Polache, A. Fernandez-Villalba, E., Pla Delfina, J. M., & Guerri, C. (1998). Influence of chronic alcohol intake on intestinal taurine and antipyrine transport in pregnant rats. *Alcohol Clinical Experimental Research*, 22, 463-467.

Martin, C. M., & Hoffman, M. A. (1993). Alcohol expectancies, living environment, peer influence, and gender: A model of college student drinking. *Journal of College Student Development*, 34, 206-211.

McMillian, D., Smith, S., & Wells-Parker, E. (1989). The effects of alcohol, expectancy, and sensation seeking on driving risk taking. *Addictive Behaviors*, 14(4), 477-483.

Meilman, P., Leichliter, J., & Presley, C. (1999). Greeks and athletes: Who drinks more? *Journal of American College Health*, 47, 187-190.

Miller, W. M. (1985). Motivation for treatment: A review with special emphasis on alcoholism. *Psychological Bulletin*, 98, 84-107.

Miller, W. R., & Del Boca, F. K. (1994). Measurement of drinking behavior using the Form 90 family of instruments. Quarterly *Journal of Studies on Alcohol*, Supplement, 12, 112-118.

Mongeau, P. A. & Johnson, K. L. (1995). Predicting cross-sex first-date sexual expectations and involvement: Contextual and individual difference factors. *Personal Relationships*, 2(4), 301–312.

Moretti, A., Ciceri, C., & Suchowsky, G. K. (1969). Effect of a combination of B complex vitamins and ascorbic acid on liver lipid content in rats intoxicated with ethyl alcohol. *Arzneimittelforschung*, 19, 1742-1743.

Muir, G., Pollitt, N., & Rooney, J. (1973). Oral vitamins in alcohol intoxication. *Quarterly Journal of Studies on Alcohol*, 34, 373-380.

National Collegiate Athletic Association. (2001). NCAA study of substance use habits of college student-athletes. Retrieved on November 14, 2006 from http://www.ncaa.org/library/research/substance_use_habits/2001/substance_use_abits.pdf

Nattiv, A., & Puffer, J. (1991). Lifestyles and health risks of collegiate athletes. *The Journal of Family Practice*, 33, 585-590.

Nelson, T., & Wechsler, H. (2001). Alcohol and college athletes. *Medicine and Science in Sports and Exercise*, 33, 43-47.

Olive, M. F. (2002). Interactions between taurine and ethanol in the central nervous system. *Amino Acids*, 23, 345-357.

Presley, C. A., Meilman, P. W., & Cashin, J. R. (1996a). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 4), 1992-94*. Carbondale, IL: Core Institute, Southern Illinois University.

Presley, C. A., Meilman, P. W., & Lyerla, R. (1995). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 2), 1990-92*. Carbondale, IL: Core Institute, Southern Illinois University.

Presley, C. A., Meilman, P. W., Cashin, J. R. & Lyerla, R. (1996b). *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment (Vol. 3), 1991-93*. Carbondale, IL: Core Institute, Southern Illinois University.

Quertemont, E., Goffaux, V., Vlaminck, A. M., Wolf, C., & De Witte, P. (1998). Oral taurine supplementation modulates ethanol-conditioned stimulus preference. *Alcohol*, 16, 201-206.

Reis, J., & Riley, W. L. (2000). Predictors of college students' alcohol consumption: Implications for student education. *The Journal of Genetic Psychology*, 16(3), 282-291.

Reyner, L. A., & Horne, J. A. (2001). Beneficial effects of an "energy drink" given to sleepy drivers. *Amino Acids*, 20, 83-89.

Reyner, L. A., & Horne, J. A. (2002). Efficacy of a functional energy drink in counteracting driver sleepiness. *Physiology and Behavior*, 75, 331-335.

Riesselmann, B., Rosenbaum, F., & Schneider, V. (1996). Alcohol and energy drink – can combined consumption of both beverages modify automobile driving fitness? *Blutalkohol*, 33, 201-208.

Rogers, P. J., & Dernoncourt, C. (1998). Regular caffeine consumption: A balance of adverse and beneficial effects for mood and psychomotor performance. *Pharmacology of Biochemical Behavior*, 59, 1039-1045.

Scholey, A. B., & Kennedy, D. O. (2004a). Cognitive and physiological effects of an "energy drink": An evaluation of the whole energy drink and of glucose, caffeine and herbal flavoring fractions. *Psychopharmacology*, 176, 320-330.

Scholey, A. B., & Kennedy, D. O. (2004b). A glucose-caffeine 'energy drink' ameliorates subjective and performance deficits during prolonged cognitive demand. *Appetite*, 42, 331-333.

Seidl, R., Peyrl, A., Nicham, R., & Hauser, E. (2000). A taurine and caffeine-containing drink stimulates cognitive performance and well-being. *Amino Acids*, 19, 635-642.

Shiv, B., Carmon, Z., & Ariely, D. (2005). Placebo effects of marketing actions: consumers may get what they pay for. *Journal of Marketing Research*, XLII, 383-393.

Smit, H. J., & Rogers, P. J. (2000). Effects of low doses of caffeine on cognitive performance, mood and thirst in low and higher caffeine consumers. *Psychopharamacology*, 152, 167-173.

Smit, H. J., & Rogers, P. J. (2002). Effects of 'energy' drinks on mood and mental performance: Critical methodology. *Food Quality and Preference*, 13, 317-326.

Smith, A. P., Rusted, J. M., Eaton-Williams, P., Savory, M., & Leathwood, P. (1990). Effects of caffeine given before or after lunch on sustained attention. *Neuropsychobiology*, 23, 160-163.

Smith, A. P. (2000). Behavioral effects of caffeine. In Parliament, T. H., Ho, C., & Schieberle, P. (Eds.). Caffeinated beverages: Health benefits, physiological effects, and chemistry (pp. 30-45). New York: Oxford University Press.

Smith, A. (2002). Effects of caffeine on human behavior. *Food Chemistry Toxicology*, 40, 1243-1255.

Sobell, L. C, Agrawal, S., Sobell, M. B., Leo, G. I., Young, L. J., Cunningham, J. A., & Simco, E. R. (2003). Comparison of a quick drinking screen with the timeline followback for individuals with alcohol problems. *Journal of Studies on Alcohol*, 64, 858-861.

Sobell, L. C., & Sobell, M. B., (2003). Alcohol consumption measures. In J. P. Allen & V. Wilson (Eds.), *Assessing alcohol problems*. (2nd ed., pp. 78-99). Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

Trindade, A. A., Takahashi, S., Quadros, I. M. H., Ferreira, S. E., & Souza-Formigoni, M. L. O. (2004). Energy drinks: Effects of caffeine and taurine in ethanol-induced locomotor activity in mice. *Proceedings of the Inaugural Symposium of the International Institute of Neuroscience of Natal*, Natal-RN, Brazil, p. 23.

Valdivia, I., & Stewart, S.H. (2005). A further examination of the psychometric properties of the Comprehensive Effects of Alcohol Questionnaire. *Cognitive Behavior Therapy.*

Vohra, B. P., & Hui, X. (2000). Improvement of impaired memory in mice by taurine. *Neural Plast*, 7, 245-59.

Waldeck, B. (1974). Ethanol and caffeine: a complex interaction with respect to locomotor activity and central catecholamines. *Psychopharmacologia*, 36, 209-220.

Warburton, D. M. (1995). The effects of caffeine on cognition and mood without caffeine abstinence. *Psychopharmacology*, 119, 66-70.

Warburton, D. M., Bersellini, E., Sweeney, E. (2001). An evaluation of a caffeinated taurine drink on mood, memory and information processing in healthy volunteers without caffeine abstinence. *Psychopharmacology*, 158, 322-328.

Ward, R. J., Kest, W., Bruyeer, P., Lallemand, F., & De Witte, P. (2001). Taurine modulates catalase, aldehyde dehydrogenase, and ethanol elimination rates in rat brain. *Alcohol and Alcoholism*, 36(1), 39-43.

Wechsler, H., Davenport, A. E., Dowdall, G. W., Grossman, S. J., & Zanakos, S. I. (1997). Binge drinking, tobacco, and illicit drug use and involvement in college athletics. *Journal of American College Health*, 45, 195-200.

Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B. & Costillo, S. (1994). Health and behavioral consequences of binge drinking in college: A national survey of students at 140 campuses. *Journal of the American Medical Association*, 272, 1672-1677.

Wechsler, H., Moeykens, B., Davenport, A., Castillo, S., & Hansen, J. (1995). The adverse impact of heavy episodic drinkers on other college students. *Journal of Studies on Alcohol*, 56, 628-634.

Werner, M. J., Walker, L. S., & Greene, J. W. (1993). Alcohol expectancies, problem drinking, and adverse health consequences. *Journal of Adolescent Health*, 14(6), 446-452.

Wikipedia The Free Encyclopedia. (2007, May 29). Red bull new york. Retrieved May 30, 2007, from http://en.wikipedia.org/wiki/Red_Bull

Williams, R., & Ricciardelli, L. (1996). Expectancies related to symptoms of alcohol dependence in young adults. Addiction, 91, 1031-1039.

Wood, M. D., Nagoshi, C. T. & Dennis, D. A. (1992). Alcohol norms and expectations as predictors of alcohol use and problems in a college student sample. *American Journal of Drug and Alcohol Abuse*, 18, 461-476.

Zacchia, C., Pihl, R. O., Young, S. N., & Ervin, F. R., (1991). Effect of sucrose consumption on alcohol-induced impairment in male social drinkers. *Psychopharmacology (Berlin)*, 105, 49-56.

Zuckerman, M. (1971). Dimensions of sensation seeking. *Journal of Consulting and Clinical Psychology*, 36(1), 45-52.

Zuckerman, M. (1979). Sensation Seeking: Beyond the Optimal Level of Arousal. Hillsdale, NJ. Lawrence Erlbaum Associates, Publishers.

Zuckerman, M. (1983). Sensation seeking and sports. *Personality and Individual Differences*, 4(3), 285-292.

Zuckerman, M. (1994). Behavioral Expressions and Biosocial Bases of Sensation Seeking: Cambridge University Press.

Zuckerman, M. (1996). The psychobiological model for impulsive unsocialized sensation seeking: A comparative approach. *Neuropsychobiology*, 34, 125-129.

Zwygheuizen-Doorenbos, A., Roehrs, T. A., Lipschutz, L., Timms, V., Roth, T. (1990). The effects of caffeine on alertness. *Psychopharmacology*, 100, 36-39.

PROJECT DESCRIPTION

The purpose of this study is to measure the quantity-frequency of use and expectancies of drinking alcohol and energy drinks. You will be asked to answer 13 quantity-frequency questions, 4 about total alcohol use, 5 about combined use, and 4 about energy drink only use. Be sure to carefully read the instructions for each of these sections. Next, you will be asked to answer an expectancy inventory, first asking for your expectancies of drinking alcohol only and then your expectancies of the combined use of energy drinks with alcohol. The entire study should take approximately 20 minutes to complete, with each section taking about 10 minutes.

As a participant in this study, I understand that:

1. This research is being conducted by Conrad Woolsey and is sponsored and supervised by Dr. Alex Waigandt of the Educational, School, and Counseling Psychology Department. The information from this research will be used for Conrad Woolsey's dissertation.

2. My participation in this study is completely voluntary. I am free to stop participating at any time. If I do not volunteer or if my participation is ended for any reason by the researcher or me, it will have no effect on any other benefits to which I am normally entitled. In addition, I do not have to answer any item I do not wish to answer.

3. All of my responses are strictly confidential. In no way will my responses be linked back to me. To further protect my identity, my signature will not be included on this informed consent letter. The data from this study will be kept locked in a secure file which will only be accessible by the researchers.

4. The results of this research may be published or presented, and I will not be identified in any such publication.

5. This research is primarily aimed at helping present and future college student-athletes by better understanding the interaction between alcohol and energy drinks. The risk inherent in completing the questionnaires is no more than encountered in ordinary daily life. The researcher has provided an environment that allows for the privacy of my answers.

6. My questions about this study have been answered. I may address further questions to Conrad Woolsey at clwbq6@mizzou.edu or by phone # 816-223-2509, Dr. Alex Waigandt at waigandta@missouri.edu phone # 573-882-4721, or Dr. Neils Beck at beckn@health.missouri.edu. For questions concerning human subject research I can call the Campus Institutional Review Board at 573-882-9585.

DEMOGRAPHIC INFORMATION

Mark an X by your response. All responses will be kept confidential.

YEAR IN SCHOOL:
- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior or grad student

AGE:
- ☐ 18
- ☐ 19
- ☐ 20
- ☐ 21
- ☐ 22
- ☐ 23+

GENDER:
- ☐ M
- ☐ F

RACE:
- ☐ White/Non-Hispanic
- ☐ Hispanic
- ☐ Black
- ☐ Asian/Pacific Highlander
- ☐ Other

TEAM:
- ☐ Baseball
- ☐ Basketball
- ☐ Cross Country
- ☐ Football
- ☐ Golf
- ☐ Gymnastics
- ☐ Soccer
- ☐ Softball
- ☐ Swimming & Diving
- ☐ Tennis
- ☐ Track & Field
- ☐ Wrestling
- ☐ Volleyball

Instructions:

This questionnaire is designed to measure alcohol and energy drink consumption. It is divided into three sections. **Please read the instructions for each section very carefully before completing the items in that section.**

Section 1: Total Alcohol Use

Please describe your use of alcohol, whether or not it involves the combined use of alcohol and energy drinks. For instance, the first question (see below) asks how many times you drink alcohol, on average, per week. If you drink alcohol alone an average of twice a week, and alcohol in combination with energy drinks an average of once a week, then please answer '3', because this represents the average number of times you drink alcohol, regardless of whether you consume alcohol alone, or consume alcohol in combination with energy drinks.

A standard 'drink' of alcohol is defined as **1.5 oz. of 80 proof liquor (a 'shot'), 12 oz of beer, or 4-5 oz of wine**.

(1) On average in the last 12 months, how many days per week did you drink alcohol?

Days/week_______

(2) When you did drink alcohol, on average, how many standard drinks would you have had in a day?

Alcoholic Drinks_______

(3) How many times in the past 12 months have you had 5 or more standard alcoholic drinks (1 alcoholic drink = equals 1.5 oz. of 80 proof liquor, 12 oz of beer, or 4-5 oz of wine) on one occasion?

Alcoholic Drinks_______

(4) In the past 12 months, what was the greatest number of standard drinks you consumed in one day?

Greatest # Standard Alcoholic Drinks_______

Section 2: Combined Use

'Combined' alcohol and energy drink use is defined as consuming an energy drink within plus or minus 4 hours of using alcohol. For example, if you had an energy drink at 6:00 pm and then started using alcohol at 10:00 pm this would still be considered combined use. Also, 'combined' use includes using an energy drink as a mixer for alcohol, or consuming alcohol and energy drinks in separate containers.

(1) On average in the last 12 months, how many days per week did you combine energy drinks and alcohol?

Days/week_______

(2) When you did combine energy drinks with alcohol, on average, how many standard drinks of alcohol and energy drinks would you have had in a day?

Alcoholic Drinks_______

Energy Drinks_______

(3) How many times in the past 12 months have you used an energy drink while having 5 or more standard alcoholic drinks (1 alcoholic drink = equals 1.5 oz. of 80 proof liquor, 12 oz of beer, or 4-5 oz of wine) on one occasion?

Alcoholic Drinks_______

(4) How many times in the past 12 months have you used alcohol while having 3 or more standard energy drinks (1 standard drink = 8 oz) on one occasion?

Energy Drinks_______

(5) In the past 12 months, when combining energy drinks with alcohol what was the greatest number of alcoholic and energy drinks you consumed in one day?

Greatest # Standard Alcoholic Drinks_______

Greatest # Standard Energy Drinks________

Section 3: Energy Drink Only Use

In this section, please report your use of energy drinks alone; that is, energy drink use more than plus or minus 4 hours from using alcohol. Thus, if you consumed an energy drink at 5PM, but did not start consuming alcohol until 10PM, this would be considered ‘energy drink only’ use. Using an energy drink on a day that you did not have any alcohol would also be an example of energy drink only use. A standard drink for energy drinks will be **8 ounces of any energy drink.**

(1) On average in the last 12 months, how many days per week did you consume energy drinks without combining them with alcohol?

Days/week______

(2) When you consumed energy drinks alone, on average, how many standard (8 oz.) energy drinks would you have had in a day?

Energy Drinks______

(3) How many times in the past 12 months have you had 3 or more standard energy drinks without alcohol (1 standard drink = 8 oz.) on one occasion?

Energy Drinks______

(4) In the past 12 months, what was the greatest number of standard energy drinks you consumed in one day without alcohol?

Greatest # Standard Energy Drinks______

Brief Comprehensive Effects of Alcohol

This questionnaire assesses two things:
1.What you would expect to happen if you were under the influence of alcohol only, and
2.Whether you think the effect is good or bad

Instructions:

1. Choose from **DISAGREE TO AGREE** depending on whether you expect the effect to happen to you **IF YOU WERE UNDER THE INFLUENCE OF ALCOHOL ONLY**. These effects will vary, depending on the amount of alcohol you typically consume. Fill in one answer for the first four boxes after each statement.
2. Choose from **BAD TO GOOD** depending on whether you think the particular effect is bad or good. We want to know if you think a particular effect is bad or good, regardless of whether or not you expect it to happen to you. Check only one answer for the last five boxes after each statement.

Example: 1. I would be... ①②③● This effect is ①②●④

1 = Disagree	1 = Bad
2 = Slightly Disagree	2 = Slightly Bad
3 = Slightly Agree	3 = Slightly Good
4 = Agree	4 = Good

IF I WERE UNDER THE INFLUENCE
FOR **DRINKING ALCOHOL ONLY**:

1.	I would enjoy sex more	①②③④	This effect is	①②③④
2.	I would feel dizzy	①②③④	This effect is	①②③④
3.	I would be clumsy	①②③④	This effect is	①②③④
4.	I would be loud, boisterous, or noisy	①②③④	This effect is	①②③④
5.	I would feel peaceful	①②③④	This effect is	①②③④
6.	I would be brave and daring	①②③④	This effect is	①②③④
7.	I would be courageous	①②③④	This effect is	①②③④
8.	I would act aggressively	①②③④	This effect is	①②③④
9.	I would feel guilty	①②③④	This effect is	①②③④
10.	I would feel calm	①②③④	This effect is	①②③④
11.	I would feel moody	①②③④	This effect is	①②③④
12.	It would be easier to talk to people	①②③④	This effect is	①②③④
13.	I would be a better lover	①②③④	This effect is	①②③④
14.	I would take risks	①②③④	This effect is	①②③④
15.	I would act sociable	①②③④	This effect is	①②③④
16.	I would be more alert	①②③④	This effect is	①②③④
17.	I would feel stronger	①②③④	This effect is	①②③④
18.	I would not sleep well	①②③④	This effect is	①②③④
19.	I would maintain a good "buzz"	①②③④	This effect is	①②③④
20.	I would be nervous or jittery	①②③④	This effect is	①②③④
21.	I would not get as drunk	①②③④	This effect is	①②③④
22.	I would sober up quicker	①②③④	This effect is	①②③④
23.	I would drive a motor vehicle	①②③④	This effect is	①②③④
24.	I would be more likely to fight	①②③④	This effect is	①②③④
25.	I would get a hangover	①②③④	This effect is	①②③④
26.	I would experience a rapid heartbeat	①②③④	This effect is	①②③④
27.	I would be more likely to get injured	①②③④	This effect is	①②③④

Brief Comprehensive Effects of Combined Use

This questionnaire assesses two things:

1. What you would expect to happen if you were under the influence of energy drinks and alcohol, and

2. Whether you think the effect is good or bad

Instructions:

1. Choose from **DISAGREE TO AGREE** depending on whether you expect the effect to happen to you **IF YOU WERE UNDER** THE **COMBINED INFLUENCE OF ENERGY DRINKS AND ALCOHOL**. These effects will vary, depending on the amount of alcohol you typically consume. Fill in one answer for the first four boxes after each statement.
2. Choose from **BAD TO GOOD** depending on whether you think the particular effect is bad or good. We want to know if you think a particular effect is bad or good, regardless of whether or not you expect it to happen to you. Check only one answer for the last five boxes after each statement.

COMBINED USE is defined as consuming an energy drink(s) within 4 hours before, during, or after drinking alcohol.

Example: 1. I would be... ①②③● This effect is ①②●④

1 = Disagree	1 = Bad
2 = Slightly Disagree	2 = Slightly Bad
3 = Slightly Agree	3 = Slightly Good
4 = Agree	4 = Good

IF I WERE UNDER THE INFLUENCE FOR **COMBINED USE**:

1.	I would enjoy sex more	①②③④	This effect is	①②③④
2.	I would feel dizzy	①②③④	This effect is	①②③④
3.	I would be clumsy	①②③④	This effect is	①②③④
4.	I would be loud, boisterous, or noisy	①②③④	This effect is	①②③④
5.	I would feel peaceful	①②③④	This effect is	①②③④
6.	I would be brave and daring	①②③④	This effect is	①②③④
7.	I would be courageous	①②③④	This effect is	①②③④
8.	I would act aggressively	①②③④	This effect is	①②③④
9.	I would feel guilty	①②③④	This effect is	①②③④
10.	I would feel calm	①②③④	This effect is	①②③④
11.	I would feel moody	①②③④	This effect is	①②③④
12.	It would be easier to talk to people	①②③④	This effect is	①②③④
13.	I would be a better lover	①②③④	This effect is	①②③④
14.	I would take risks	①②③④	This effect is	①②③④
15.	I would act sociable	①②③④	This effect is	①②③④
16.	I would be more alert	①②③④	This effect is	①②③④
17.	I would feel stronger	①②③④	This effect is	①②③④
18.	I would not sleep well	①②③④	This effect is	①②③④
19.	I would maintain a good "buzz"	①②③④	This effect is	①②③④
20.	I would be nervous or jittery	①②③④	This effect is	①②③④
21.	I would not get as drunk	①②③④	This effect is	①②③④
22.	I would sober up quicker	①②③④	This effect is	①②③④
23.	I would drive a motor vehicle	①②③④	This effect is	①②③④
24.	I would be more likely to fight	①②③④	This effect is	①②③④
25.	I would get a hangover	①②③④	This effect is	①②③④
26.	I would experience a rapid heartbeat	①②③④	This effect is	①②③④
27.	I would be more likely to get injured	①②③④	This effect is	①②③④

VITA

Conrad Woolsey was born February 20, 1981 in Smithville, Missouri. While competing in track and field, Conrad completed his B.S. degree in Physical Education with a minor in Coaching from Northwest Missouri State University. After graduating from NWMSU, Conrad transferred to the University of Missouri to pursue his M.Ed. and Ph.D. in Health Education and Promotion with an emphasis in Sport Psychology. As a graduate student, he was a 4 time NCAA All-American and Big XII Champion for the University of Missouri Track & Field team. Currently, Conrad is an Assistant Professor teaching Psychology and Sport Psychology at Lincoln University in Jefferson City, Missouri.