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Combining alcohol and energy drinks: An examination of psychosocial constructs and alcohol outcomes among college students using a longitudinal design

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Abstract

Combining alcohol and energy drinks (e.g., Red Bull and vodka) is a significant problem on college campuses. To date, few studies have examined psychosocial constructs specific to alcohol-energy drink cocktail (AmED) consumption that could be amenable to change via prevention efforts targeting this population. The aim of the current study was to examine differences in AmED-specific attitudes, beliefs, normative perceptions among students who report AmED use compared to college student drinkers who consume alcohol only. In addition, these two groups were compared on their intentions to consume AmEDs, actual AmED use, and other drinking outcomes using a longitudinal design. Participants ($N = 386$, 59% female) completed a web-based survey in the spring of their first year of college and fall of their second year assessing alcohol-energy drink cocktail use, psychosocial decision-making constructs, heavy drinking, and alcohol-related consequences. Findings revealed that combiners of alcohol and energy drinks had more positive attitudes and beliefs about AmED use, higher perceived peer norms, and stronger intentions toward future use. Accordingly, at Time 2, this group reported significantly higher AmED use, along with high-risk drinking and related consequences. The findings reinforce that AmED use is associated with risky drinking practices, and suggest potential targets for change for future prevention efforts.

Keywords

Alcohol-energy drink cocktails; college students; high-risk drinking; longitudinal design

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Declaration of interest:

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the article.

INTRODUCTION

Combining alcohol and energy drinks is a growing trend among college students that is positively associated with heavy episodic drinking and alcohol-related consequences (Arria et al., 2010; O'Brien, McCoy, Rhodes, Wagoner, & Wolfson, 2008; Reissig, Strain, & Griffiths, 2009; Thombs et al., 2010). Studies suggest almost one-quarter of college students report combining alcohol and energy drinks (O'Brien et al., 2008). Popular alcohol-energy drink cocktails (AmEDs) on college campuses typically contain a mix of heavily caffeinated beverages (e.g., energy drinks such as Red Bull or Monster) and alcohol. Whereas combining alcohol and energy drinks have been linked to increased alcohol consumption and alcohol related consequences (Berger, Fendrich, Chen, Arria, & Cisler, 2011; Brache & Stockwell, 2011; O'Brien et al., 2008; Thombs et al., 2010; Woolsey, Waigandt, & Beck, 2010), the underlying associations for this relationship are unclear. Research that has examined this issue suggests consuming AmEDs can reduce subjective perceptions of intoxication, even though these effects are not detected in objective measures or blood alcohol content (Ferreira, de Mello, Pompeia, & de Souza-Formigoni, 2006; Oteri, Francesco, Caputi, & Calapai, 2007). Further, studies have shown that students who tended to underestimate their blood alcohol levels were more likely to consume larger amounts of alcohol, which increased their likelihood of experiencing alcohol-related harm (Mallett, Bachrach, & Turrisi, 2009). Thus, there is a need to better understand college students' AmED use due to the associated exacerbation of high-risk drinking behaviors and alcohol-related consequences.

To date, studies examining college students' AmED use primarily have been descriptive in nature, focusing on prevalence rates and the association between AmED use and related consequences (O'Brien et al., 2008; Oteri et al., 2007; Thombs et al., 2010; Woolsey et al., 2010). A second stream of research has focused on examining subgroups of students who commonly engage in this behavior. Studies indicate that AmED use is more prevalent among males and intercollegiate student-athletes than among other students (Miller, 2008; Woolsey et al., 2010). More recently, research has shown individuals use AmEDs for reasons that include the perception of increased energy, ability to consume more alcohol, availability, and to enjoy the taste (Marczinski, 2011; O'Brien et al., 2008; Peacock, Bruno, & Martin, 2013). Together these studies have been critical in establishing the dangers associated with AmED use; however, from a prevention standpoint more work is needed to understand variables that may respond to brief interventions. The current study attempts to contribute to the existing literature by identifying psychosocial variables associated with AmED use.

Several constructs including one's attitudes, beliefs, normative perceptions, and intentions have been identified as influential in the health behavior decision-making process (Ajzen & Fishbein, 1980). These variables have been investigated in the general college drinking literature and found to be predictive of alcohol use within this population. For example, past research has shown that both college students' beliefs about and attitudes towards drinking are associated with alcohol consumption (e.g., Darkes & Goldman, 1993; Mallett et al., 2009; Wechsler, Dowdall, Davenport, & Castillo, 1995; Weitzman, Nelson, & Wechsler, 2003). Prior college studies have also confirmed the importance of exploring perceived peer

norms about drinking (Borsari & Carey, 2001; Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). Accordingly, these constructs are targeted in efficacious intervention efforts that aim to reduce alcohol use and related consequences among college students (Turrise et al., 2009; Turrise, Abar, Mallett, & Jaccard, 2010). However, little is known about the role of AmED-specific attitudes, beliefs, norms, and behavioral intentions in relation to subsequent AmED consumption, drinking tendencies, and consequences among college students. Such knowledge could be helpful in designing prevention and intervention efforts specific to this high-risk drinking behavior.

In the current study, we addressed this gap in the literature and examined AmED-specific decision-making variables, AmED use, and other drinking outcomes using a longitudinal design. We compared AmED consumers to students who drink alcohol only on attitudes, beliefs, perceived norms, and behavioral intentions specific to AmED consumption (first year of college) and AmED use, heavy drinking, and consequences (second year of college). We hypothesized that students who consumed AmEDs would hold more positive attitudes about AmED consumption, more favorable beliefs about the effects of AmED use, higher perceived peer norms regarding AmED consumption, and stronger intentions to engage in AmED consumption, relative to non-AmED consumers. In addition, we expected that AmED consumers would report higher levels of AmED use, heavy drinking and alcohol-related consequences at follow-up.

METHODS

Participants

Participants were selected from the control group of a larger, randomized trial on parent-based interventions (see Turrise et al., 2013). The sample consisted of 387 first-year students (59% female) from a large university in the Northeastern United States. All participants included in the sample reported alcohol consumption by describing their current alcohol usage (e.g., “I have never tried alcohol”; “I am a light, social, non-problem drinker”; “I am a heavy, problem drinker”) and participants indicating no current alcohol use (i.e., I have never tried alcohol or I have tried alcohol, but currently don’t drink) were excluded from the analyses. In addition, 27% of participants reported AmED consumption. Participants were primarily Caucasian (91%); the rest of the participants were African-American (3%), Hispanic (3%), Asian (2%), and Other (1%). The mean age of the sample was 18 ($SD=0.45$ years). Surveys were completed during the spring semester of their first year of college.

Procedures

We selected students randomly from the university registrar’s list of incoming students during the summer prior to college matriculation. Invitation letters were mailed to all potential participants in the summer of 2009, along with information about study procedures, the informed consent form, and a URL and Personal Identification Number (PIN) for accessing a baseline survey. In addition, email invitations were sent to each person’s university email address, along with mailed post card reminders and email reminders. We obtained a 75.4% response rate at baseline, which is consistent with similar studies of college student populations (Larimer et al., 2007; Turrise et al., 2009). Participants

were eligible to receive \$15 for completing the spring survey and \$35 for completing the fall survey. Alcohol use was assessed at baseline and we excluded those individuals who reported no current alcohol use from the current study.

We administered a web-based survey at Time 1 (i.e., spring semester of 2010) and at Time 2 (i.e., fall semester of 2010), with a high retention rate at follow-up ($N=387$; 90.2%). Based on Chi-square analyses, we determined that there were no significant differences in AmED use at baseline between those who completed the study and those who did not. The university's Institutional Review Board approved the study and participant treatment complied with APA ethical guidelines.

Time 1 variables

Group—To determine current AmED consumers, we asked, “Do you drink alcohol mixed with energy drinks (e.g., Red Bull and vodka, or Jagerbombs)?” The response options were “yes” or “no.” Participants who responded “yes” were classified as AmED consumers, while those who answered “no” were classified as non-consumers of AmEDs. The measure has shown to be uncorrelated with social desirability (Marzell, 2011; Marzell & Turrissi, 2010) and consistent with previous research screening for AmED use (e.g., Marczynski, 2011; O'Brien et al., 2008; Thombs et al., 2010).

Attitude—We asked participants to indicate their level of agreement regarding their attitude, “I feel favorably about consuming alcohol mixed with energy drinks,” using a five-point scale ranging from *strongly disagree* (−2) to *strongly agree* (2) (Marzell, 2011; Varvil-Weld, Marzell, Turrissi, Mallett, & Cleveland, 2013).

Beliefs—Four items were used to assess beliefs about energy drink cocktails. Items were scored on a five-point scale ranging from *strongly disagree* (−2) to *strongly agree* (2). The items were: “I can consume more alcohol when I choose to combine alcohol and energy drinks”; “I can party longer when I choose to mix alcohol with energy drinks”; “I like the way combining alcohol and energy drinks makes me feel”; and “I expect to feel an enhanced ‘buzz’ when I consume alcohol mixed with energy drinks.” We summed these four items to create a composite frequency score for beliefs ($\alpha=0.78$) (Marzell, 2011; Varvil-Weld et al., 2013).

Perceived peer norms—We assessed the construct of perceived peer norms using a modified measure created by Larimer, Turner, Mallett, and Geisner (2004). Participants indicated their agreement, on a five-point scale ranging from *strongly disagree* (−2) to *strongly agree* (2), to the statement: “My closest friends would approve of me drinking alcohol mixed with energy drinks” (Marzell, 2011; Varvil-Weld et al., 2013).

Behavioral intention—To assess behavioral intent, participants indicated intent to consume alcohol mixed with energy drinks in the following 30 days. Responses included a five-point scale ranging from *strongly disagree* (−2) to *strongly agree* (2) (Marzell, 2011).

Demographics—We asked participants to provide their age, gender, year in school, and ethnicity.

Time 2 Variables

Heavy drinking—We used two items from the Quantity/Frequency/Peak (QFP) questionnaire (Dimeff, Baer, Kivlahan, & Marlatt, 1999; Marlatt et al., 1998) to assess peak drinking and frequency of drunkenness. Participants were asked to report the maximum number of drinks they consumed on a peak occasion within the 30 days prior to the assessment. The answer scale consisted of: *never* (0), *1–2 times* (1), *3–4 times* (2), *5–6 times* (3), *7–8 times* (4), *9 or more times* (5). A standard drink definition was included for all measures (i.e., 12 oz. beer, 10 oz. wine cooler, 4 oz. wine, 1 oz. 100 proof (1¼ oz. 80 proof) liquor)."

AmED consumption—AmED consumption was measured over the past month using a modified version of the Daily Drinking Questionnaire (Collins, Parks, & Marlatt, 1985). We asked, "Consider a typical week during the last month. How much alcohol mixed with energy drinks (e.g., Red Bull and vodka or Jagerbombs), on average, (measured in number of drinks), do you drink on each day of a typical week?" We provided a response scale for each day of the week and we summed the responses for Thursday, Friday, and Saturday to create a measure of the number of AmEDs consumed on a typical weekend. This approach has been shown to capture typical drinking quantity during the weekend, which is the window of time during the week when the majority of college students consume alcohol (Turrissi et al., 2009, 2010)

Alcohol-related consequences—We measured alcohol-related consequences at follow-up (Time 2) using a brief version of the Young Adult Alcohol Problems Screening Test (YAAPST) (Hurlbut & Sher, 1992). Using methodology consistent with a study conducted by Turrissi and Ray (2010), seven items were selected from the YAAPST that represent common alcohol-related problems reported by college students, including sexual, physical, and academic consequences. Students indicated the number of times they experienced each consequence during the past 3 months on a five-point scale, which ranged from *never* (0) to *more than 10 times* (4). We created three variables to measure three categories (i.e., sexual, physical, and academic). We used two items to assess sexual consequences: "Has drinking ever gotten you into sexual situations which you later regretted?" and "Because you had been drinking, have you ever had sex with someone you wouldn't ordinarily have sex with?" ($\alpha=0.75$). We measured physical consequences with three items: "Have you had a headache (hangover) the morning after you had been drinking?"; "Have you felt very sick to your stomach or thrown up after drinking?"; and "Have you ever awakened the morning after a good bit of drinking and found that you could not remember a part of the evening before?" ($\alpha=0.72$). Lastly, we measured academic consequences with two items: "Have you ever received a lower grade on an exam or paper than you should have because of drinking?" and "Have you showed up late for work or school because of drinking, a hangover, or an illness caused by drinking?" ($\alpha=0.60$). We then summed item scores within each category.

Data analysis

We used a series of one-way ANOVAs to compare AmED consumers and non-consumers on attitudes, beliefs, and norms about AmED consumption and intentions to engage in AmED consumption at Time 1. The same analysis was used to compare AmED consumers

and non-consumers on AmED consumption, heavy drinking, and alcohol-related consequences at follow-up (Time 2) after controlling for baseline drinking. To reduce the probability of Type I errors, we applied a Bonferroni correction that set p value significance to 0.001. In addition, additional analyses that regressed drinking and consequences at Time 2 onto AmED attitudes at Time 1 and AmED use at Time 1 were conducted to evaluate the degree to which AmED attitudes and consumption were associated with drinking and consequences at Time 2. The amount of missing data was trivial (i.e., less than 2%), which allowed us to use the EM (estimate missing) maximum likelihood approach in SPSS (see Schafer & Graham, 2002).

RESULTS

Consistent with O'Brien et al. (2008), approximately 27% of the sample reported AmED consumption during the past 30 days (Time 1). Examination of the F -ratios revealed that AmED consumers scored higher for all variables at Time 1 compared to non-AmED consumers (see Table I). Individuals who consumed AmEDs had a more positive attitude related to AmEDs than non-consumers, as well as more positive beliefs specific to AmED use. AmED consumers also had higher perceived peer norms such that they were more likely to agree their close friends approved of their AmED use. In addition, AmED users at Time 1 reported stronger intentions to consume AmEDs in the future compared to non-consumers. Finally, examination of the F -ratios also revealed that AmED consumers scored higher on all variables at Time 2 compared to students who drink alcohol only. Specifically, AmED consumers reported significantly higher AmED consumption, heavy alcohol use, and sexual, academic and physical consequences.

Regression analyses further revealed that AmED attitude at Time 1 was significantly associated with academic consequences at Time 2 ($b=0.17$, $t=2.41$, $p < 0.02$) such that students who felt more favorable toward AmED use were more likely to experience academic consequences during their first year of college. Lastly, AmED use at Time 1 was significantly associated with all types of alcohol-related consequences (i.e., academic, physical, and sexual) at Time 2 (academic $b=0.65$, $t=3.69$, $p < 0.001$; physical $b=0.93$, $t=3.67$, $p < 0.001$; sexual $b=0.33$, $t=2.79$, $p < 0.01$) indicating students who reported higher AmED consumption at Time 1, reported experiencing higher rates of alcohol-related consequences during their first year of college.

DISCUSSION

Several descriptive studies have shown associations between AmEDs and alcohol-related harm (Berger et al., 2011; Brache & Stockwell, 2011; O'Brien et al., 2008; Thombs et al., 2010; Woolsey et al., 2010); however, less is known about the mechanisms that underlie the risks associated with consuming these beverages. To the best of our knowledge, we are the first to conduct an AmED-specific examination of psychosocial constructs found in many health behavior theories (e.g., attitudes, beliefs, perceived peer norms, and behavioral intention) in an effort to inform targeted interventions that reduce high-risk college drinking. A noteworthy strength of the present study is the use of a longitudinal design in an effort to understand the underlying psychosocial factors influencing college students to engage in this

high-risk drinking behavior. Findings supported our hypothesis that AmED consumers report more favorable attitudes, norms, and intentions toward AmED consumption relative to college students who drink alcohol only. When comparing the two groups on all drinking and consequence outcomes, our findings are consistent with previous research (Berger et al., 2011; Brache & Stockwell, 2011; O'Brien et al., 2008) such that AmED consumption was related to higher risk for heavy alcohol use, subsequent AmED use, and sexual, physical, and academic consequences.

These findings have implications for interventions aimed at reducing high-risk drinking and consequences among college students. The first year in college has been shown to be a particularly high-risk time for heavy alcohol consumption and experiencing alcohol-related consequences (Baer, 2002; Sher & Rutledge, 2007) as well as an ideal time to intervene for the prevention of alcohol-related harm (Turrisi, Mallett, Mastroleo, & Larimer, 2006). Currently, interventions focus on reducing risky drinking; however, more work is needed to examine the efficacy of interventions on reducing AmED use considering its association with harmful drinking and related consequences. For example, interventions that target college students' attitudes, beliefs and peer norms related to AmED use may be helpful in preventing heavier drinking and alcohol-related harm associated with this high-risk drinking behavior. This strategy has been used successfully in interventions for other risky behaviors (e.g., Larimer & Currence, 2007), however, more research is needed to evaluate whether tailoring the interventions to incorporate AmED use is efficacious.

Limitations and future directions

Some limitations and future directions to the current research should be considered. Whereas the study incorporated a longitudinal design, only two data collection points were included. Future work may benefit from adding more time points to examine the relationship between AmED use and subsequent high-risk drinking outcomes throughout the entire college experience. It is also important to note that the results indicate that students who combine alcohol and energy drinks scored significantly higher on drinking and consequence outcomes. While the association is significant we cannot infer causation. For instance, it may be that individuals who choose to partake in this behavior are more prone to higher risk-taking in general. Future studies are needed to examine additional predictors (i.e., personality traits) as well as initiation patterns of risky drinking behavior and outcomes in order to parse out causal variables. Further, participants in this study were asked retrospectively about their drinking behaviors, which may have resulted in self-report bias. Despite its limitations, previous literature supports this method for behavioral assessment, and it has proven to be extremely reliable (Burlinson, Kaminer, & Dennis, 2006; Sobell & Sobell, 1990). Future studies that assess AmED use, along with predictors of this behavior, and other drinking outcomes at the event-level could offer a better understanding of AmED use among this population. Another limitation is that the sample was very homogeneous with respect to age and ethnicity. Future research is needed on larger and more diverse samples. Additionally, the alphas for the brief version of the Young Adult Alcohol Problems Screening Test (YAAPST) measure are low to marginal; however, these alphas are consistent with other research that examined these items in the same manner (Turrisi & Ray, 2010). Finally, although the focus of the present research was to compare AmED users and

non-users, future research would benefit from examining differences that exist among different types of AmED users. Such research would provide insight into the relationship between quantity and frequency of AmED use and problems that would help inform prevention efforts.

CONCLUSION

The current study examined predictors and outcomes of AmED use among first year college students. Individuals who reported combining alcohol and energy drinks had more positive attitudes and beliefs about AmED use, higher perceived peer norms of others' use, and stronger intentions toward future use compared to students who did not consume AmEDs. These students also reported significantly higher rates of alcohol consumption and related consequences during their first year of college. Intervention efforts that incorporate and address AmED predictors may be beneficial for reducing drinking and consequences among college students who engage in this risky drinking behavior.

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Table I

Means and standard deviations (in parentheses) for AmED consumers and non-consumers.

	Consumers (<i>n</i> =106)	Non-Consumers (<i>n</i> =281)	<i>F</i> -Ratio (<i>df</i> =1, 385)
Time 1 Variables			
Attitude	0.13 (0.98)	−0.88 (1.00)	78.99 *
Beliefs	0.32 (3.02)	− 1.69 (3.23)	31.01 *
Perceived Peer Norms	0.74 (0.81)	−0.09 (1.03)	54.82 *
Behavioral	0.08 (1.06)	− 1.31 (0.88)	171.35 *
Intentions			
Time 2 Variables			
AmED Use	1.32 (2.51)	0.49 (1.54)	15.54 *
Peak	9.24 (4.92)	6.93 (4.14)	21.47 *
Drunkenness	2.56 (1.39)	1.85 (1.37)	20.37 *
Sexual Consequences	1.82 (2.06)	1.00 (1.56)	18.04 *
Physical Consequences	10.16 (4.29)	7.97 (4.46)	18.93 *
Academic	2.20 (2.40)	1.04 (1.78)	26.90 *
Consequences			

Note:

*
 $p < 0.001$.