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Daily Conformity Drinking Motivations are Associated with Increased Odds of Consuming Alcohol Mixed with Energy Drinks

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Abstract

Recent research indicates that individuals drank more heavily and experienced more harms on days they consumed alcohol mixed with energy drinks (AmEDs). Limited research, thus far, has examined predictors of AmED use on a daily level. Drinking motives, or reasons for drinking, are shown to discern AmED users from non-users, but the extent to which daily drinking motives covary with AmED use has not been tested. The current study used a daily diary design to determine how motives differ between AmED and other drinking occasions. Participants included 122 college students (73.8% women) with a mean age of 20.39 years. Participants completed up to 14 daily surveys, resulting in 389 drinking days (40 days involved AmED use). Participants reported on their drinking motives at baseline as well as on each drinking day. Multilevel models revealed that, after controlling for other motives, AmED use was more likely on days where conformity motives were higher than usual and was less likely when enhancement motives were higher. Daily social and coping motives as well as all motives measured at baseline were unassociated with AmED use. Our findings suggest that conformity motives, or drinking to fit in with others, are the most salient drinking motive predicting AmED use on a drinking day. Given that conformity motives are often less associated with alcohol use outcomes in general, these findings highlight AmEDs as a unique alcoholic beverage. Clinicians and interventionists working

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Contributors

This research was in part based on a doctoral dissertation submitted to Old Dominion University by Dr. Linden-Carmichael. Dr. Linden-Carmichael conceptualized the research question, collected the data, conducted the statistical analysis, and wrote the first draft of the paper. Dr. Lau-Barraco provided substantial guidance on conceptualizing study aims and substantial feedback on the manuscript.

Conflict of Interest

The authors report no conflicts of interest.

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with frequent AmED users should consider the unique conditions under which AmEDs are consumed.

Keywords

alcohol and energy drinks; drinking motives; college students; daily diary

1. Introduction

Individuals who consume alcohol mixed with energy drinks (AmEDs), such as Red Bull and vodka, are at greater risk for negative consequences from drinking, such as higher rates of substance use, driving under the influence, risky sexual behavior (see [1] for a review), and risk for injury (see [2]). Individuals may experience greater risk from drinking AmEDs because energy drinks can mask the sedative effects of alcohol [3], potentially creating a risky situation in which the drinker is unaware of their actual level of intoxication. Our recent daily diary work extended our understanding of the potential real-world risks of AmEDs in within-subject studies. Specifically, findings revealed that individuals drank more heavily and experienced more alcohol-related harms on days in which they consumed AmEDs than other drinking occasions [4]. Drinkers appear to anticipate these negative effects from drinking AmEDs [5], suggesting that they are motivated to consume AmEDs despite harms. In order to fully understand the drinking patterns of AmED users, additional research is needed to understand underlying reasons, or motivations for consuming AmEDs.

Drinking motives, or one's reasons for drinking alcohol, are strong predictors of alcohol use and alcohol-related problems [6, 7]. The motivational model of alcohol use [6, 8] proposes four primary motivations for drinking: social motives (drinking to be sociable), enhancement motives (drinking to increase positive affect), coping motives (drinking to reduce negative affect), and conformity motives (drinking to fit in with others). Generally, social and enhancement motives ("positive motives") are tied more so to drinking behavior whereas conformity and coping motives ("negative motives") are more strongly tied to alcohol-related harms [6]. The motivational model of alcohol use could be a useful conceptual basis for better understanding a drinker's reasons for consuming AmEDs. In prior studies, most researchers who examined motivations for AmED use have inquired about reasons attributable only to AmEDs, such as drinking to feel less tired [9] or more energetic [10], rather than comparing reasons for drinking across different beverage types. Research on AmEDs and traditional drinking motives have suggested that users report more positive drinking motives than non-users [11] and that users are more motivated to drink than non-users in general, across all positive motives assessed (i.e., fun/social reasons, to relax, to improve self-image [12]).

There are two major gaps in our knowledge of drinking motives and AmEDs. First, prior work has been limited to between-subject comparisons, such as comparing AmED users and non-users. Thus, our understanding of motives is limited to what factors may increase one's odds of being an AmED user, rather than why someone chooses to drink an AmED on a particular occasion. Second, prior work has inquired about reasons for drinking *in general* or

over a large window of time. Such questions require participants to aggregate their responses across prior drinking occasions, which could produce inaccurate estimates and limit our understanding of the way in which drinking motives fluctuate over time.

The current study further explored data from our prior work that employed a within-subjects, daily diary approach comparing AmED and other drinking days on use, harms [4] and socio-environmental context of drinking [13] by determining the way in which drinking motives differ between use occasions. The motivational model of alcohol use was used as our framework as it is an empirically-based model that encompasses motivations for drinking that could be applicable across both AmED and non-AmED drinking occasions. Our primary aim was to determine which motives were uniquely associated with odds of using AmEDs. Based on prior research indicating that AmED users report stronger social and enhancement motives than non-users, we hypothesized that these motives would be stronger on days where individuals consumed AmEDs relative to days they drank other types of alcohol. As a secondary aim, we compared the relationships between (a) drinking motives as measured *daily* predicting daily AmED use and (b) drinking motives as measured at *baseline* predicting daily AmED use in order to determine which motives were more salient in predicting AmED use on a given drinking occasion.

2. Materials and Methods

2.1 Participants and Procedure

Participants consisted of young adult (18 to 25 year-old) college students who reported consuming caffeine mixed with alcohol at least once in the past week and engaging in heavy episodic drinking (4+/5+ drinks for women/men on one occasion) at least twice in the past month. To be eligible, participants also must have reported daily Internet access for two weeks. After providing informed consent, participants completed a baseline assessment remotely that took approximately 30 to 45 minutes to complete. If eligible, participants were e-mailed information regarding a follow-up 14-day daily diary study. Participants were provided with research credit in their courses for completing the baseline assessment.

For the daily diary portion, participants were emailed a link and sent a text message reminder each day to complete a short survey on yesterday's drinking behavior. Consistent with prior research (e.g., [14]), participants were asked to complete the daily survey between 2:30 to 7 pm each day to control for potential time of day effects. Daily surveys were scheduled to start on a Tuesday and end on a Monday to ensure that data were collected across two consecutive weekends. Each daily survey took approximately 5 minutes to complete. Participants were provided with the option to receive research credit or \$10 for the daily diary study. If they completed all 14 days, they were entered into a raffle to win a \$50 gift card. This study was approved by the university's Institutional Review Board. All APA ethical guidelines were followed [15].

Six hundred participants were screened, of which 363 were ineligible to participate (e.g., were over the age of 25). Only participants who completed at least two daily surveys and one drinking day were included in the current study. Of the 237 participants who were eligible, 115 completed no follow-up or too few of assessments and were thus not included

in subsequent analyses. Participants who completed fewer than two surveys did not differ on gender, ethnicity, or baseline alcohol and caffeine use compared to those who completed two or more. Participants with fewer daily entries were, however, significantly younger ($M = 19.75$, $SD = 1.69$) than those who completed more surveys ($M = 20.32$, $SD = 2.04$), $t(226.10) = -2.34$, $p = .020$.

The final analytic sample consisted of 122 participants with a mean age of 20.39 ($SD = 2.08$) years. Ninety (73.8%) participants were women. Ethnicity was 54.9% Caucasian/White, 27.9% African American/Black, 6.6% self-reported “other” or biracial, 5.7% Hispanic, 3.3% Asian, and 1.6% Native American. Class standing was 27.9% freshman, 23.8% sophomore, 13.9% junior, 32.8% senior, and 1.6% did not respond. Participants completed an average of 12.42 ($SD = 2.16$) daily reports out of 14. Only drinking episodes were included in study analyses. The final analytic sample provided 389 drinking days; 40 of which (10.3%) involved AmED use specifically.

2.2 Baseline Measures

2.2.1 Drinking motives—The Drinking Motives Questionnaire (DMQ-R [6]) was used to measure typical motivations for drinking. The 20-item scale consists of four subscales: coping (e.g., “To forget your worries”), conformity (e.g., “To fit in with a group you like”), social (e.g., “To be sociable”), and enhancement (e.g., “Because it gives you a pleasant feeling”). Response options ranged from 1 (*almost never/never*) to 5 (*all of the time*). Higher scores on each subscale indicate greater endorsement of that particular drinking motive.

2.3 Daily Measures

2.3.1 Drinking motives—The DMQ-R was adapted to reflect last night’s motivations for drinking in general. Specifically, participants were asked, “Thinking about your drinking *last night*, how much would you say that you planned to drink for each of the following reasons?”

2.3.2 AmED use—Participants reported the type of alcoholic drinks they consumed yesterday, including beer, wine, shots, non-caffeinated mixed drinks, caffeinated mixed drinks, and alcohol mixed with energy drinks specifically. AmED use was determined based on whether they indicated drinking at least one alcoholic beverage mixed with an energy drink (e.g., Red Bull and vodka). AmED use was coded as 0 (*did not drink AmEDs yesterday*) or 1 (*consumed at least one AmED yesterday*).

2.4 Data Analytic Plan

Multilevel modeling was used to conduct analyses given the nested nature of the data (i.e., daily predictors were nested within individuals) and an uneven number of daily observations for each individual. Daily (“level-1”) drinking motives were group-mean centered and results can be interpreted as levels of drinking motives relative to themselves. Baseline (“level-2”) drinking motives were grand-mean centered and results could be interpreted as levels of drinking motives relative to others. The outcome, odds of being an AmED day, was measured dichotomously, thus a zero-inflated Bernoulli distribution was specified. All analyses were conducted using HLM 7.01 software [16].

3. Results

3.1 Daily Drinking Motives

Descriptive statistics are provided in Table 1 comparing drinking motives on days in which participants consumed AmEDs and days where participants consumed other types of alcohol, averaging across all participants and days.

To test Aim 1, all four drinking motives were entered simultaneously as level-1 predictors of whether AmEDs were consumed, where drinking days (or time, t) were nested within individuals (i). A level-1 covariate was included reflecting whether it was considered a weekend by college student culture (0 = weekday [Monday thru Wednesday], 1 = [Thursday thru Sunday]). Gender (0 = female, 1 = male) also was included as a level-2 covariate. Because all drinking motives were entered simultaneously, significant findings can be interpreted as the effect of a given drinking motive, controlling for other motives. Specifically, the following equation was tested:

Level-1:

$$\begin{aligned} \text{AmED}_{ti} = & \pi_{0i} + \pi_{1i} * (\text{Social Motives}_{ti}) \\ & + \pi_{2i} * (\text{Enhancement Motives}_{ti}) \\ & + \pi_{3i} * (\text{Conformity Motives}_{ti}) \\ & + \pi_{4i} * (\text{Coping Motives}_{ti}) \\ & + \pi_{5i} * (\text{Weekend}_{ti}) \end{aligned}$$

Level-2:

$$\begin{aligned} \pi_{0i} = & \beta_{00} + \beta_{01} * (\text{Male}_i) + r_{0i} \\ \pi_{1i} = & \beta_{10} \\ \pi_{2i} = & \beta_{20} \\ \pi_{3i} = & \beta_{30} \\ \pi_{4i} = & \beta_{40} \\ \pi_{5i} = & \beta_{50} \end{aligned}$$

Results for the simultaneous model are displayed in Table 2 (left column of results). Overall, daily conformity motives were positively associated with odds of using AmEDs on a given drinking day, and daily enhancement motives were negatively related to odds of using AmEDs after controlling for the potential influence of the day of the week and gender. Social and coping motives were unassociated with AmED use.

When testing the individual associations between each daily motive and AmED use, only conformity motives were significantly associated with odds of using AmEDs (see far right column in Table 2). Social, enhancement, and coping motives were unrelated to AmED use.

3.2 Typical Drinking Motives

To test Aim 2, all drinking motives measured at baseline were entered simultaneously as level-2 predictors of AmED use on a given day along with day of the week and gender as covariates:

Level-1:

$$\text{AmED}_{ti} = \pi_{0i} + \pi_{1i} * (\text{Weekend}_{ti})$$

Level-2:

$$\begin{aligned}\pi_{0i} &= \beta_{00} + \beta_{01} * (\text{Social Motives}_i) + \beta_{02} * (\text{Enhancement Motives}_i) + \beta_{03} * (\text{Conformity Motives}_i) + \beta_{04} * (\text{Coping Motives}_i) + \beta_{05} * (\text{Gender}_i) \\ \pi_{1i} &= \beta_{10}\end{aligned}$$

Findings for this simultaneous model are presented in Table 3 (left column of results). Overall, findings revealed that none of the baseline drinking motives were significantly associated with AmED use. Findings were consistent when examining individual baseline motives and daily AmED use (see far right column in Table 3). That is, social, enhancement, conformity, and coping motives were each unrelated to AmED use.

It should be noted that these models were tested separately in order to examine the association between daily drinking motives and AmED use as well as baseline drinking motives and AmED use without parsing out unique variance between the two; however, findings were consistent when including drinking motives as level-1 and level-2 predictors within the same model.

4. Discussion

The primary aim of the current study was to test daily drinking motives as predictors of daily AmED use. Contrary to expectations, individuals were *more* likely to consume AmEDs on days where they reported higher conformity motives than usual. In addition, individuals were *less* likely to consume AmEDs on days where enhancement motives were higher. Social and coping motives were unassociated with daily AmED use, perhaps suggesting that these motives differ less between drinking occasions, even on a daily level. In addition, all drinking motives measured at baseline were unassociated with odds of using AmEDs on a given day, suggesting that motivations on a particular day are more salient in predicting use than one's general reasons for drinking. Findings concerning the baseline motives are interesting considering prior research that baseline drinking motives were stronger when drinking alcoholic beverages that were not mixed with energy drinks than when drinking AmEDs [11]. Our findings may differ from prior work based on our assessment of AmED use. In other words, prior work has asked participants to reflect on their behavior during AmED occasions in general, rather than on a specific day, as was done in the present study. Thus, it may be that baseline drinking motives are predictive of general AmED drinking behavior but may be less predictive of whether someone opts to drink AmEDs on a specific drinking occasion. Aggregating behavior across AmED and alcohol only occasions may result in recall biases, which may explain discrepancies with prior cross-sectional work.

Given these discrepant results, however, additional research is needed to replicate our daily findings. Overall, our findings support the utility of using a daily design to assess predictors of a given AmED use occasion, the proximal influence of drinking motives on drinking behavior [17], and the idea that daily reasons for drinking serve as even more proximal predictors of consumption than reasons for drinking in general.

Our findings were generally contradictory to our original hypothesis. It was anticipated that social and enhancement motives would be higher on AmED days given that AmEDs are regarded as a beverage consumed in a social setting [5]. It is possible that the social aspects to drinking AmEDs may be more attributed to wanting to fit in with others. Prior work with these daily diary data has shown that AmEDs are more likely to be used on days where individuals drink at a bar or club and pre-game [13]. These situations are highly social, and thus individuals may feel more pressured to conform within these settings than others. Indeed, drinking norms, or perceptions of how much others drink and approve of drinking AmEDs have been shown to be a salient factor predicting one's own use [18]. In terms of enhancement motives, although initially surprising that these motives were lower on AmED days, it is possible that items referring to drinking to obtain a "pleasant feeling" are driving the negative association between enhancement motives and AmEDs, rather than items such as "to have fun." That is, the "pleasurable" aspects to enhancement motives may be less attributed to drinking AmEDs, given the context surrounding AmED use (e.g., drinking at a bar/club, while partying).

It is remarkable that conformity motives were associated with AmED use in light of prior findings that conformity motives are often unassociated or less strongly associated with alcohol use outcomes than other motives [6]. For example, Arbeau and colleagues [19] found that individuals reported social drinking motives on 50% of drinking days, whereas conformity motives were indicated on only 3% of drinking days. Our findings may suggest that conformity motives are perhaps more relevant in certain situations, and may be beverage-specific. Conformity motives may be particularly problematic for AmED users, given that stronger conformity motives are associated with experiencing alcohol-related harms, even after controlling for amount of alcohol consumed [6]. This may suggest that individuals who drink with the intention of fitting in with others may drink in such a way that is linked with negative consequences. In concert with prior findings that drinking AmEDs on a given occasion is linked with heavier alcohol use and greater alcohol-related harms than other drinking occasions [4], it is possible that drinking to conform may serve to underlie or exacerbate this link. In working with college students who are frequent AmED users, it may be helpful for clinicians and interventionists to consider the unique conditions under which AmEDs are typically consumed.

It is also interesting to note that descriptively, motivations to drink were higher on AmED days relative to alcohol-only days. While multilevel modeling is needed to take into account the nested data structure to extract the unique variance from drinking motives, higher motives in general may reflect experimental evidence suggesting that drinking AmEDs may elicit alcohol priming, leading to greater motivations to drink relative to alcohol alone [20]. However, given our multilevel findings that compared days in which individuals consumed

only alcohol relative to AmEDs, our data suggests that conformity motives are the only motive that is uniquely linked to higher odds of consuming AmEDs on a daily level.

Limitations to our study include few ($n = 40$) AmED days and requiring participants to recall about last night's drinking motives. Future work examining drinking motives and AmED use could benefit from collecting more AmED days with more in-depth assessment tools, such as ecological momentary assessment. Here, individuals could report on their motives before drinking occurs. Relatedly, given other motivations for drinking AmEDs that have been documented [9, 10], it would be useful to simultaneously compare traditional drinking motives and AmED-specific motives between AmED and alcohol only days in order to determine which are most salient. Finally, our sample consisted of college students reporting frequent heavy episodic drinking and frequent consumption of alcoholic beverages mixed with caffeine. While this sample was needed to obtain a substantial number of observations for a daily diary study, generalizability to lighter drinkers may be limited.

5. Conclusions

Despite limitations, this study was the first to examine drinking motives as daily predictors of AmED use. To date, prior work has compared AmED users and non-users, which can limit our understanding of how drinking motives differ between drinking occasions and predict one's odds of drinking AmEDs. Given that only drinking motives measured daily, rather than at baseline, were predictive of AmED use, these findings highlight the importance of comparing examining within-person predictors of AmED consumption.

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Highlights

- Compared motives on alcohol and energy drink (AmED) and other drinking occasions.
- Conformity motives are the most salient motive predicting AmEDs on a drinking day.
- Findings highlight AmEDs as a unique alcoholic beverage.

Table 1

Descriptive Statistics Across Study Variables

	Non-AmED days (<i>n</i> = 349)	AmED days (<i>n</i> = 40)
<i>M</i> (<i>SD</i>) social drinking motives last night	11.08 (6.33)	15.30 (6.39)
<i>M</i> (<i>SD</i>) enhancement drinking motives last night	11.44 (5.28)	12.98 (4.65)
<i>M</i> (<i>SD</i>) conformity drinking motives last night	6.65 (3.57)	8.21 (4.16)
<i>M</i> (<i>SD</i>) coping drinking motives last night	8.32 (4.29)	9.14 (3.67)

Note. AmED = alcohol mixed with energy drinks.

Table 2**Multilevel Models of Daily Drinking Motives Predicting Daily Alcohol and Energy Drink Use**

	AmED Use OR (CI)	AmED Use OR (CI)
Intercept	0.05 (0.02, 0.11) **	--
Level 1: Daily level		
Social Motives	1.12 (0.98, 1.28)	1.05 (0.94, 1.18)
Enhancement Motives	0.78 (0.62, 0.99) *	1.00 (0.85, 1.18)
Conformity Motives	1.21 (1.01, 1.45) *	1.20 (1.05, 1.38) *
Coping Motives	1.11 (0.91, 1.36)	1.04 (0.85, 1.28)
Weekend	0.93 (0.37, 2.35)	--
Level 2: Baseline level		
Male	0.53 (0.12, 2.29)	--

Note. AmED = alcohol mixed with energy drinks by 0 = did not drink AmEDs during the previous night's drinking episode and 1 = used at least one AmED during the previous night. The left AmED use column represents model results when all motives were entered simultaneously. The right column represents individual models when each motive was entered separately. Within both the simultaneous and individual models, day of the week and sex were entered as covariates. OR = odds ratio from Bernoulli multilevel modeling distribution. CI = confidence interval.

**
 $p < .001$.

*
 $p < .05$.

Table 3**Multilevel Models of Baseline Drinking Motives Predicting Daily Alcohol and Energy Drink Use**

	AmED Use OR (CI)	AmED Use OR (CI)
Intercept	0.04 (0.02, 0.10) *	--
Level 1: Daily level		
Weekend	1.07 (0.58, 1.96)	
Level 2: Baseline level		
Social Motives	1.21 (0.97, 1.50)	1.11 (0.97, 1.26)
Enhancement Motives	0.94 (0.78, 1.15)	1.03 (0.90, 1.18)
Conformity Motives	1.13 (0.97, 1.31)	1.07 (0.95, 1.20)
Coping Motives	0.89 (0.74, 1.07)	1.00 (0.88, 1.13)
Male	0.36 (0.08, 1.63)	--

Note. AmED = alcohol mixed with energy drinks by 0 = did not drink AmEDs during the previous night's drinking episode and 1 = used at least one AmED during the previous night. The left AmED use column represents model results when all motives were entered simultaneously. The right column represents individual models when each motive was entered separately. Within both the simultaneous and individual models, day of the week and sex were entered as covariates. OR = odds ratio from zero-inflated Bernoulli multilevel modeling distribution. CI = confidence interval.

* $p < .001$.