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Testing a Model of Caffeinated Alcohol-specific Expectancies

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Abstract

Introduction—The present study sought to further understand the association between caffeinated alcoholic beverage (CAB) use and alcohol-related risks. In particular, we focused on the role of two identified expectancies specific to CAB use: intoxication enhancement and avoidance of negative consequences. Although outcome expectancies are consistent predictors of substance use, limited research has examined expectancies related to CAB use and their association with alcohol-related behaviors, such as protecting themselves from alcohol-related harms. Consequently, the present study examined CAB-specific expectancies and protective behavioral strategies (PBS) as mediators of CAB use and negative consequences.

Methods—Participants were 322 (219 women) college drinkers who completed self-report measures of typical CAB and alcohol use, CAB-specific expectancies, PBS use, and alcohol-related harms.

Results—Structural equation modeling revealed, after controlling for typical non-CAB heavy alcohol use, a significant indirect effect of CAB use to alcohol-related problems through avoidance of negative consequences CAB expectancies and PBS use. However, intoxication enhancement expectancies did not mediate this association.

Conclusions—Thus, our findings indicate that heavier CAB use was associated with stronger expectations that drinking CABs can help avoid negative consequences. These beliefs were related to using fewer PBS when drinking and a greater likelihood of experiencing problems. Given that

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Contributors

All authors significantly contributed to and approved the final manuscript. Ashley N. Linden-Carmichael designed the study, conceptualized the research aims and hypotheses, conducted statistical analyses, and wrote the Introduction, Results, and Discussion sections. Cathy Lau-Barraco helped further conceptualize the research aims and hypotheses and provided feedback on the manuscript. Amy L. Stamates wrote the Method section and assisted in proof-reading the manuscript.

Conflict of Interest

All authors declare that there are no conflicts of interest for the current paper.

these expectancies may be underlying mechanisms of CAB use, their inclusion in existing alcohol interventions may be beneficial.

Keywords

Caffeinated alcohol; expectancies; protective behavioral strategies; risky drinking; college students

1. Introduction

Caffeinated alcoholic beverages (CABs), or self-mixed beverages containing caffeine (e.g., Red Bull) and alcohol (e.g., vodka), are popular among college students (Berger, Fendrich, & Fuhrmann, 2013) and are associated with negative outcomes (see Linden & Lau-Barraco, 2014 for a review). Experimental evidence suggests drinking CABs reduces one's perception of intoxication (e.g., headache, motor coordination failures) without reducing one's actual level of impairment (e.g., Marczinski & Fillmore, 2006). Thus, CAB consumption may heighten an individual's vulnerability to experiencing harms. Efforts are needed to identify factors that contribute to or underlie the relationship between CAB use and harms.

Social learning theory (SLT; Bandura, 1969, 1977; Maisto, Carey, & Bradizza, 1999) could provide a backdrop for identifying constructs related to CAB consumption and problems. According to SLT, an individual's beliefs about the effects of a substance, or outcome expectancies, can impact their drug use. Indeed, expectancies predict problem-drinking development (Christiansen, Smith, Roehling, & Goldman, 1989) and mediate the influence of antecedents and drinking behavior (Sher, Walitzer, Wood, & Brent, 1991). Outcome expectancies also are related to an individual's use of strategies to protect themselves from alcohol-related harms. Protective behavioral strategies (PBS) are cognitive-behavioral techniques one can use in order to limit alcohol use and problems (Martens, Ferrier, Sheehy, Corbett, Anderson, & Simmons, 2005). PBS use is negatively associated with drinking (Linden, Lau-Barraco, & Milletich, 2014) and drinking-related harms (Martens, Taylor, Damann, Page, Mowry, & Cimini, 2004). Stronger endorsement of positive alcohol expectancies has been shown to relate to less PBS use (Linden et al., 2014) and more negative drinking consequences (Madson, Moorer, Zeigler-Hill, Bonnell, & Villarosa, 2013). These findings support PBS as a relevant factor to consider in understanding the link between expectancies and drinking.

While some studies have examined caffeine or alcohol expectancies related to CAB consumption (e.g., Heinz, Kassel, & Smith, 2009; Lau-Barraco & Linden, 2014; Lau-Barraco, Milletich, & Linden, 2014), there have been few investigations of CAB-specific expectancies (e.g., Mallett, Marzell, Scaglione, Hultgren, & Turrisi, 2014; Varvil-Weld, Marzell, Turrisi, Mallett, & Cleveland, 2013). One study developed a validated measure of CAB-specific expectancies and identified two expectancy factors: intoxication enhancement (IE; e.g., having more energy to party) and avoidance of negative consequences (ANC; e.g., allowing one to drive safer; MacKillop, Howland, Rohsenow, Few, Amlung, Metrik, & Calise, 2012). IE expectancies were found to be associated with more frequent CAB use while ANC expectancies were not. These preliminary relationships suggest that CAB use is

propelled by one's expectations that these beverages will enhance their drunkenness rather than avoid harms. The association between subtypes of CAB expectancies and other drinking-related behaviors (e.g., alcohol-related harms; PBS use) awaits empirical investigation.

In the present study, we sought to test types of CAB-specific expectancies as mediating factors in a conceptual model that encapsulates CAB use, CAB-specific expectancies, PBS use, and alcohol-related problems. We hypothesized that heavier CAB use would be positively associated with stronger IE expectancies, but not ANC expectancies. Further, we hypothesized that heavier CAB use would predict stronger CAB-specific expectancies, which would relate to less frequent PBS use and, in turn, more alcohol-related harms experienced.

2. Material and Methods

2.1 Participants and Procedure

Participants were 322 (219 women) drinkers recruited through an undergraduate psychology research pool at a mid-size East Coast university. Mean age was 20.55 (*SD* = 3.84) years. Ethnicity was 44.7% Caucasian, 38.8% African American, 6.2% Hispanic, 2.8% Asian, 0.9% Native Hawaiian/Pacific Islander, 0.3% Native American/Alaskan Native, 5.6% self-identified as "other", and 0.6% did not respond. Class standing was 46.0% freshmen, 24.2% sophomores, 14.9% juniors, 13.7% seniors, 0.9% self-identified as "other", and 0.3% did not respond.

After providing informed consent, participants completed self-report questionnaires in small groups on campus that took approximately 1 hour to complete. This study was approved by the university's college committee on human subjects research and followed APA (2002) guidelines. Participants were provided course credit for participating.

2.2 Measures

CAB and alcohol use was assessed with the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) in which participants reported the number of CABs and alcoholic beverages consumed during a typical week. Typical weekly drinking quantity was used as a measure of CAB use. Heavy episodic drinking frequency was used as a measure of alcohol use. CAB-specific expectancies were measured with the 9-item Caffeine plus Alcohol Combined Effects Questionnaire (CACEQ; MacKillop et al., 2012). Participants reported the extent to which they agreed with statements relating to CAB use ranging from 1 to 5. Subscales include IE (α = .80) and ANC (α = .84). PBS was assessed with the Protective Behavioral Strategies Survey (PBSS; Martens et al., 2005). This 15-item scale asks the extent to which participants use each item when using alcohol/partying ranging from 1 to 5. Of the original three subscales, only two subscales were used: limiting/stopping drinking and manner of drinking, as research indicates they are most proximal to a drinking situation (e.g., Frank, Thake, & Drake, 2012). Internal consistency was .85. Alcohol-related problems in the past 12 months was assessed with the 48-item Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong, & Colder, 2006) with response options *yes*

and *no*. Higher scores indicate greater likelihood of experiencing problems. Internal consistency was .93.

3. Results

Prior to conducting analyses, outliers were Winsorized (Barnett & Lewis, 1994) and missing values were inspected. Missing data ranged from 0% to 2.5% across study variables. The results of Little's (1988) omnibus test for the pattern missing completely at random (MCAR) was non-significant, $\chi^2(62) = 80.56$, $p = .057$, suggesting the data were MCAR. Thus, expectation maximization algorithms were used to impute missing data. Descriptive statistics and intercorrelations are presented in Table 1. Overall, CAB use was associated with greater alcohol-related problems, more frequent heavy episodic drinking, and less frequent PBS use. Regarding expectancies, CAB use was associated with stronger CAB-specific ANC expectancies but unrelated to IE expectancies.

Structural equation modeling tested the hypothesized model in Mplus 6.1 (Muthén & Muthén, 1998–2010). Bootstrapping was used to address non-normality within the data. The chi-square goodness of fit statistic (χ^2), comparative fit index (CFI), root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) were used to evaluate model fit. Prior research supports that CAB users tend to be heavier drinkers in general (e.g., Brache & Stockwell, 2011), which could account for some of the risks associated with CAB use; thus, we controlled for typical heavy episodic drinking behavior. One latent variable (i.e., PBS) was created with the subscale scores, "limiting/stopping drinking" and "manner of drinking". Results indicated that the hypothesized model (see Figure 1) provided an acceptable fit to the data, $\chi^2(7) = 9.78$, $p = .201$, CFI = .993, RMSEA = .035, SRMR = .023 (Hu & Bentler, 1999).

ANC and IE expectancies were tested as separate mediators in the pathways of CAB use on alcohol-related problems through its relationship with expectancies and PBS. Results revealed that CAB ANC expectancies significantly mediated the pathway, $B = 0.01$ with 95% BC CI [0.00, 0.03], such that greater CAB use was associated with stronger ANC expectancies, less frequent PBS use and more harms. CAB-specific IE expectancies did not emerge as a significant mediator, $B = 0.01$ with 95% BC CI [−0.01, 0.04].

4. Discussion

The current study tested a conceptual model that partially explained the pathway between CAB use and alcohol-related problems. Our model was able to account for 31% of the variance in negative consequences. We also examined the link between CAB consumption and harms through their association with CAB-specific expectancies and PBS use in drinking situations. Contrary to our hypotheses, ANC expectancies was a more relevant mediator than IE expectancies. Specifically, our results indicated a significant pathway of CAB use, CAB ANC expectancies, PBS use, and problems. That is, heavier CAB users have stronger perceptions that drinking CABs can help prevent or minimize negative outcomes from drinking. These beliefs, however, appear to be linked to a chain of negative consequences that include failing to protect themselves from harm and experiencing drinking-related problems. Findings did not support a significant pathway of CAB use, IE

expectancies, PBS use, and problems. In other words, perceptions that drinking CABs can allow them to stay alert for longer and become intoxicated faster was not a key factor in the relationship between CAB use and experience of harm.

We also examined the relationship between both types of CAB-specific expectancies and the number of CABs consumed. We found that stronger ANC expectancies were positively associated with CAB use but IE expectancies were not. This is in contrast to MacKillop and colleagues' (2012) findings that only IE expectancies were associated with CAB use. One possibility for the divergent results may be the assessment of CAB consumption across both investigations. Our study inquired about CAB use quantity but MacKillop and colleagues assessed frequency. Perhaps IE expectancies are more related to how *often* one drinks whereas ANC is salient for how *many* CABs are consumed. It is possible that perceptions of CABs' energizing properties better determine whether someone will drink CABs on any drinking occasion, but perceiving that CABs can protect against harms may give a false sense that they can drink more.

Regarding associations between CAB-specific beliefs and PBS use, we found that both expectancies were related to less frequent use of PBS. This is consistent with prior research examining alcohol-only outcome expectancies, such that positive beliefs about the effects of alcohol were negatively associated with PBS use (Bonar et al., 2012; Linden et al., 2014; Madson et al., 2013). In the case of CAB use, a similar pattern is observed with ANC expectancies. Particularly, the negative association between these expectancies and PBS use suggests that when college students perceive that drinking CABs protects them from deleterious effects of alcohol, they may not see a need to use PBS. PBS use also was negatively associated with IE expectancies, such that perceiving energy enhancing outcomes from drinking CABs may make one less inclined to use PBS. Perhaps students drinking CABs to get "buzzed" more quickly are unlikely to be concerned with using PBS, as PBS would prevent them from achieving the desired effects.

Findings from the current study offer implications for incorporating information on problematic CAB use in brief motivational interventions (BMIs; see Larimer & Cronce, 2002 for a review). CAB users may benefit from BMIs that address factors relevant to CAB outcomes, including those found in the present study (e.g., PBS, ANC expectancies), as well as including CAB-specific information in the personalized feedback given in the BMI. Prior investigations suggest that receiving beverage-specific information within an intervention can help decrease the use of certain beverages (e.g., malt liquor; Werch, Jobli, Moore, DiClemente, Dore, & Brown, 2005). Thus, including CAB-specific information may increase the efficacy of reducing heavy CAB consumption.

There are several limitations that should be noted. Our study is cross-sectional and therefore prevents causal inferences. Additionally, our study relied on self-report estimates, which may be subject to recall biases or social desirability. Furthermore, the majority of our sample consisted of females, which may limit our ability to generalize to men. Lastly, our findings did not control for impulsivity, which can be related to CAB outcomes (Brache & Stockwell, 2011). Some research does, however, suggest that the link between CAB use and consequences exists after considering risk-taking propensity (Brache & Stockwell, 2011).

5. Conclusions

Our findings contributed to the existing literature by further illuminating factors associated with CAB consumption. We found preliminary evidence that heavier CAB consumption and stronger CAB-specific expectancies were related to less PBS use. Our findings also revealed that heavier CAB use was associated with stronger expectations that CABs can help avoid negative consequences and, consequently, a failure to use PBS when drinking and greater likelihood of experiencing problems. The underlying influence of ANC expectancies and PBS may indicate their relevance for inclusion in existing alcohol interventions.

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Highlights

- Developed a conceptual model of caffeinated alcoholic beverage (CAB) use and harms.
- Expectancies and protective behavioral strategies mediated study associations.
- CAB-specific expectancies may warrant inclusion in alcohol interventions.

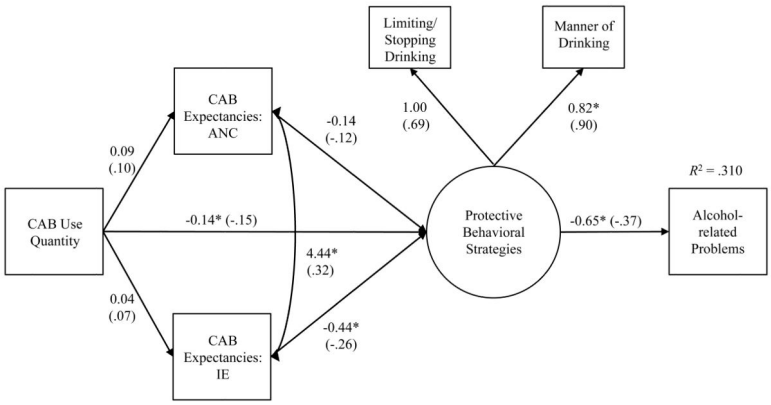

Figure 1.

Avoidance of negative consequences (ANC) and intoxication enhancement (IE) caffeinated alcohol-specific expectancies as mediators of the association between caffeinated alcoholic beverage (CAB) use and outcomes (i.e., protective behavioral strategies latent factor and alcohol-related problems). Typical heavy episodic non-caffeinated alcohol consumption was included as a control but is not displayed here for simplicity. Statistical significance levels pertain to unstandardized estimates based on 95% bias-corrected confidence intervals generated from 10,000 bootstrap samples. Standardized estimates are enclosed in parentheses. *$p < .05$.

Table 1

Intercorrelations and Descriptive Statistics for Study Variables

Variable	1	2	3	4	5	6	7
1. CAB use quantity	--						
2. CAB IE expectancies	.10	--					
3. CAB ANC expectancies	.11*	.33***	--				
4. PBSS-L	−.15**	−.18**	−.14*	--			
5. PBSS-M	−.24***	−.32***	−.21***	.62***	--		
6. YAACQ	.23***	.22***	.18**	−.35***	−.41***	--	
7. Heavy episodic drinking	.27***	.12*	.05	−.25***	−.33***	.44***	--
M	3.76	10.39	12.80	20.45	14.51	11.16	1.2
SD	5.40	3.03	4.68	7.58	4.73	9.19	41.17

Note. Correlations are based on expectation maximization imputations. CAB = caffeinated alcoholic beverage; IE = intoxication enhancement; ANC = avoidance of negative consequences; PBSS = Protective Behavioral Strategies Survey (M = manner of drinking subscale; L = limiting/stopping drinking subscale); YAACQ = Young Adults Alcohol Consequences Questionnaire.

*** $p < .001$.

** $p < .01$.

* $p < .05$.