Is Expectancy Reality? Associations between Tension Reduction Beliefs and Mood Following Alcohol Consumption

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Abstract

Aims—The present study investigated whether tension reduction (TR) expectancies were uniquely associated with self-reported mood following in-lab alcohol administration, given that little research has addressed this association. We also tested whether level of experience with alcohol, which may influence the learning of expectancies, moderated expectancy-mood associations.

Method—Regularly drinking college students (N = 145) recruited through advertisements completed self-report measures of positive alcohol expectancies, alcohol involvement, demographics, and pre- and post-drinking mood, and then consumed alcohol ad-lib up to 4 drinks in the laboratory.

Results—Regression analyses controlling for pre-consumption mood, blood alcohol concentration (BAC), and all other positive expectancies showed TR expectancies to be a marginally significant positive predictor of negative mood post-drinking. This association was significant only for those who achieved lower BACs in lab and those who reported less involvement with alcohol (i.e., lower typical quantity, heavy episodic drinking frequency, and years of regular drinking).

Conclusions—Findings suggest that associations between expectations for mood and actual post-drinking mood outcomes may operate differently for less versus more involved drinkers. Clinical implications pertain to early intervention, when expectancies may be less ingrained and perhaps more readily modified.

Keywords

Tension Reduction; Expectancies; College students; Alcohol; Mood

Is Expectancy Reality? The Influence of Tension Reduction Beliefs on Mood Following Alcohol Consumption

Heavy drinking is common in college (Cooper, 2002; Knight, Wechsler, & Kuo, 2002; Kuo, Adlaf, & Lee, 2002; Wechsler, Lee, Kuo, 2000). Theory and research have pointed to the importance of cognitive variables in the prediction of drinking behavior. This study examined the link between cognitions in anticipation of alcohol's effects (i.e., alcohol expectancies) and actual post-consumption mood effects, as well as individual differences that may influence this association.

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Alcohol Expectancies: Theoretical Underpinnings

Alcohol expectancies are beliefs about alcohol's effects (Goldman, Brown, & Christiansen, 1991; Goldman & Rather, 1993). Anticipation of positive outcomes from drinking (positive alcohol expectancies, PAEs) has long been associated with alcohol use in college students (Burden & Maisto, 2000; Goldman et al., 1987; Sher et al., 1996; Wood, Nagoshi, & Dennis, 1992). Several theories have been used to explain the relationship between PAEs and alcohol use (e.g., expectancy theory; Bolles, 1972; Goldman, Brown, & Christiansen, 1987; behavioral choice or self-perception theories; Bem, 1978, Vuchinich & Tucker, 1988). The present study is informed by Social Learning conceptualizations (SLT; Bandura, 1997; Maisto, Carey, & Bradizza, 1999).

SLT emphasizes reinforcement of PAEs, which may include one's subjective experience of alcohol's effects (de Wit, Uhlenhuth, & Pierri, 1987; Chutuape & de Wit, 1994; Duka, Tasker, & Stephens, 1998). These reinforcing effects result not just from alcohol's pharmacological properties, but also from contextual and individual factors (Bolon & Barling, 1980; Marlatt, 1976; Sher, Wood, & Wood, 1996). SLT also posits that cognitions about alcohol are fundamental to the learning and reinforcement of alcohol behaviors, shaping and being shaped by experience. While expectancy theory (Bolles, 1972; Goldman, Brown, & Christiansen, 1987) suggests expectancies will predict behavior (i.e., drinking) and behavioral-choice/self-perception theories (Bem, 1978, Vuchinich & Tucker, 1988) suggest behavior will predict expectancies, these theories place little emphasis on learning from experience with drinking. In contrast, according to SLT, learning of expectancies is strongly influenced by personal experience with alcohol (Sher et al., 1996; Bauman, Fisher, & Bryan, 1985; Smith, Goldman, & Greenbaum, 1999).

Interplay Between Mood and Alcohol Expectancies

Many types of PAEs have been identified, including those pertaining to alcohol's ability to alter mood (Goldman et al., 1987; Fromme, Stroot, & Kaplan, 1993). In SLT, affective experience is important to the learning of alcohol information (Maisto et al., 1999). Thus, drinking that is accompanied by increased positive mood (i.e., positive reinforcement) and/or decreased negative mood (i.e., negative reinforcement) will facilitate the learning of affect-relevant expectancies.

The role of *negative* affect in drinking has been shown to be of particular importance. Beginning with the "Tension Reduction Hypothesis" there has been much interest in the inter-relatedness of negative affect, alcohol cognitions, and drinking (Conger, 1951; 1956; Frone, 2008; Hussong, Hicks, & Levy, 2001). Though the literature is mixed (Read, Wood, & Kahler, 2003), some studies have linked drinking to reduce negative affect to problematic drinking (Carey & Correia, 1997; Cooper, Agocha, & Sheldon, 2000; Carpenter & Hasin, 1998a; 1998b). Moreover, beliefs regarding alcohol's ability to ameliorate negative affect (i.e., tension reduction [TR] expectancies) have been implicated in problem drinking in college students (Brown, 1985; Kassel, Jackson, & Unrod, 2000).

A related line of research, the stress-dampening literature, has demonstrated that alcohol may attenuate negative affect after stressor tasks (Greeley & Oei, 1999; Levenson et al., 1980). Some of these studies have examined the role of expectancies in predicting individual differences in stress-response-dampening effects (e.g., Corcoran, 1994; Sayette, Breslin, & Wilson, 1994; Sher & Walitzer, 1986). Though some of these studies did find some support for the association between expectancies and the magnitude of stress-response (e.g., Corcoran, 1994), the findings are mixed and point to the need for further research designed specifically to examine this association. In the present study, we seek to further our understanding of the role of beliefs pertaining to alcohol's effect on negative affect in the

prediction of post-drinking mood. This work diverges somewhat from much of the stress-response dampening literature in that we focus on the subjective mood experienced by individuals after drinking in a neutral situation rather than their alcohol-induced resilience to attempts at provoking anxiety. Moreover, we extend past studies on stress-response dampening by investigating the role of alcohol expectancies as a primary means by which alcohol use is related to post-drinking mood experiences.

Individual Differences and Learning

Affective and cognitive factors involved in learning likely do not operate similarly for all individuals or under all conditions. The amount of alcohol consumed will affect the subjective experience of drinking, as well as expectations for future drinking outcomes. This is evident in research documenting greater mood-altering effects at higher intoxication levels (Robbins & Brotherton, 1980), and greater expectations for positive outcomes with higher imagined alcohol doses (Earlywine & Martin, 1993; Guarna & Rosenberg, 2000; Read & O'Connor, 2006).

Past drinking patterns also influence both future drinking and the formulation of alcohol expectancies. Drinkers report differing subjective effects of alcohol based on their level of prior alcohol involvement (Dunn & Yniguez, 1999; Holdstock, King, & de Wit, 2000); older individuals and those with more drinking experience may have more strongly formed expectancies than newer or lighter drinkers (Dunn & Goldman, 1996; Rather & Goldman, 1994). Less well understood is whether more experience predicts *more accurate* expectancies. It is possible that expectancies somehow guide behavior in the absence of confirmation of beliefs regarding the positive effects of alcohol (c.f., Bolles, 1972, expectancy theory). Yet, SLT would suggest it is more likely that with associations between expectations and drinking outcomes becoming more ingrained with repeated pairing (i.e., use), expected mood effects will more reliably predict mood following alcohol use in more experienced or involved drinkers (Vogel-Sprott & Fillmore, 1999).

The Present Study

A number of studies have examined the relationship between expectancies and objective drinking behavior (e.g., when and how much someone drinks). Yet, with only a handful of exceptions (Sher, 1985; Fromme & Dunn, 1992; Wall, Thrussell, & Lalonde, 2003; Young & Oei, 2000), few studies have had the primary aim of examining the association between expectancies and the subjective experience of alcohol (e.g., how someone experiences inebriation relative to their expectations). Virtually no research has focused on individual differences that may moderate this association. Moreover Moreover, little attention has been given to whether mood-specific expectancies in particular, rather than overall positive expectancies, predict post-consumption mood. Accordingly, the present study examined how expectations for less negative affect uniquely influence subjective mood following alcohol consumption as SLT would predict. Further, we sought to test whether the TR expectancy-mood association was moderated by individual differences in levels of intoxication or prior alcohol involvement.

Hypotheses

According to SLT, individuals who hold TR beliefs do so because they have experienced first-hand, and learned to expect, mood-alleviation from alcohol. If true, post-drinking mood outcomes should correspond to one's expectations. Thus, our first hypothesis was that higher TR expectancies would be associated with lower negative mood after in-lab alcohol consumption, after controlling for variability in pre-drinking mood.

As alcohol's mood-altering effects are more apparent at higher intoxication levels (Robbins & Brotherton, 1980), it may be at higher blood alcohol concentrations (BACs) where the learning and reinforcement of mood-relevant expectancies tend to occur. Further, individuals may *purposely* drink to levels allowing them to achieve expected outcomes. Accordingly, stronger associations between TR expectancies and post-drinking negative affect were hypothesized for those achieving higher (vs. lower) in-lab BACs.

Third, we expected associations between TR expectancies and post-drinking negative mood to be moderated by level of prior alcohol involvement, indexed by (1) years regularly drinking, (2) typical quantity of consumption, and (3) frequency of heavy episodic drinking (i.e., 4+/5+ drinks for females/males). We expected that anticipated and actual effects of alcohol on negative mood would be more strongly associated for more involved drinkers as they have had more opportunities to directly experience the mood altering effects of drinking. TR expectancies are most relevant theoretically to negative affect. Therefore, we forwarded no specific hypotheses regarding TR expectancies and positive mood.

Method

Participants

Eligible participants were regular drinkers (i.e., at least weekly for the past 3 months), aged 21–24, and enrolled in a 4-year university. Following initial screening, 158 eligible students completed experimental procedures. One participant did not meet age requirements, two withdrew, and ten had missing data. The resulting sample consisted of 145 (72 female) students. The majority (n = 125, 87%) were Caucasian, 1% (n = 1) were Hispanic, 2% (n = 3) were Asian, 7% (n = 10) were Black, and 4% (n = 5) identified themselves as "Other." Over half (n = 78, 54%) were seniors, and average age was 21.4 (SD = 0.70).

Overview of Procedure

Data for the present study were collected as part of a larger project that sought to test the effects of mood and (implicit and explicit) cognition on alcohol use among college students in a laboratory setting. As part of this, in-laboratory alcohol consumption was examined following manipulation of positive and negative affect.

Participants were recruited with flyers, radio, and newspaper ads and were screened by telephone. Participants were ineligible if they reported concern about their alcohol use, prior alcohol treatment, medical contraindications to alcohol use, or that they did not like beer.

Upon arrival, legal drinking age was confirmed with identification and participants provided informed consent. Females were administered hormonal pregnancy tests to confirm non-pregnant status. Participants were reminded that they would be drinking alcohol, and agreed to remain in the laboratory until their BAC reached .02. Eligibility information was reviewed and confirmed, and baseline breath analysis was established.

After completing demographic and baseline mood measures, the aims of this larger study involved random assignment to positive, negative, or neutral mood induction using the International Affective Picture System (IAPS; Center for the Psychophysiological Study of Emotion and Attention, 1994). Next, participants completed an expectancy reaction-time task followed by questionnaires in which mood again was assessed. This mood measurement was used as the pre-consumption mood variable in the present study. Self-report measures and the Timeline Follow Back interview (Sobell & Sobell, 1992) were administered. Next, a short set of IAPS slides were administered to re-induce mood effects for purposes of the larger study.

Next, participants were informed that they would engage in the taste-test segment of the study, and were given two 24-ounce pitchers of two types of beer. They were instructed that they must at least taste each type of beer, but that beyond this taste, they could drink as much or as little of either or both types as desired. After five minutes, the research assistant re-entered the room and provided the participant with beverage preference (i.e., taste, smell) questionnaires. The research assistant periodically checked on the participant and offered to pour more beer. After 30 minutes, remaining beer was cleared from the table. On average, participants drank 21.4 ounces (SD=13.3) of beer, representing about 2 standard drinks and 45% of the total amount provided. This consumption took place over an average of 25 (SD= 5.7) minutes out of the 30 minute time period allotted.

Participants again completed a mood measurement, which was used as the post-consumption mood variable in the present study. Fifteen minutes following the end of the alcohol administration, breath analysis was administered. Participants were debriefed, and, once their BAC reached .02, they were paid $50. Procedures were approved by the university IRB.

With the goal of answering the present research question of whether TR expectancies predict actual post-drinking mood we examined only those measures from the larger study that were pertinent to such an investigation (see Measures). We also took several steps to ensure that tests of our hypotheses were not influenced by the mood induction. These steps are detailed in the Results section.

Measures

Demographic Information—Demographic items in the assessment battery included gender, age, ethnicity, and year in school.

Positive and Negative Affect—Affect was assessed pre-and post-consumption with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). Participants rated current positive (e.g., interested, excited) and negative (e.g., scared, irritable) mood on a five-point, 20-item scale (1 = very slightly/not at all, 5 = extremely). The PANAS has strong psychometric properties (Watson et al., 1988). Coefficient alpha in this sample was .90 (.90) for the positive and .67 (.81) for the negative scale at pre- (post-) consumption.

Alcohol Involvement—Participants were asked "At what age did you begin drinking alcohol regularly (at least one drink per month)?" As they were required to be regular drinkers at the time of study participation, this number was subtracted from each participant's current age to determine number of years as a regular drinker. Daily consumption was assessed with the calendar-based Time Line Follow Back Interview (TLFB; Sobell & Sobell, 1992), conducted for the previous 30 days. This yielded data to calculate typical quantity (i.e., number of drinks consumed per drinking day) and frequency of heavy episodic drinking (i.e., past 30 day frequency of consuming 4+/5+ drinks [females/ males]).

Self-reported Expectancies—The 38-item Comprehensive Effects of Alcohol Scale (CEOA; Fromme et al., 1993) assessed expectations for positive and negative effects of alcohol use. Individuals rated the extent to which they agreed with each item (4-point Likert-type scale; 1 = disagree, 4 = agree). The present study analyzed positive expectancy factors, which include Sociability (e.g., "I would act sociable," 8 items, alpha = .86), Tension Reduction (e.g., "I would feel calm," I would feel peaceful," and "My body would be

relaxed," 3 items, alpha = .63), Liquid Courage (e.g., "I would feel unafraid," 5 items, alpha = .83), and Sexuality (e.g., "I would be a better lover," 4 items, alpha = .77).

Blood Alcohol Concentration (BAC)—In-lab BAC was measured by breath analysis at 15 minute intervals following the end of the 30-minute consumption period. The BAC variable of interest to the present study was that taken at the first of these 15-minute intervals.

Results

Descriptives and Bivariate Correlations

Post-drinking negative PANAS scores were significantly skewed and kurtotic. A single outlier was recoded to one unit greater than the next most extreme value in the distribution (Tabachnick & Fidell, 2001), reducing skewness and kurtosis within range of typically suggested cutoffs (Kline, 2005). Descriptive statistics and bivariate correlations among model variables are presented in Table 1.

Multivariate Analyses

As mentioned, we tested whether the mood induction that was part of the larger study affected our results. Across the three mood conditions (neutral vs. negative vs. positive), ANOVAs revealed no significant differences on pre-consumption PANAS scores (F=.17, p=.84; M = 11.48 vs. 11.76 vs. 11.60), post-consumption PANAS scores (F=.31, p=.74; M = 11.02 vs. 11.20 vs. M = 11.32), nor on TR expectancies (F=1.85, p=.16; M = 8.42 vs. 9.04 vs. 8.87), confirming that mood condition would not confound examination of central research questions of the present study. Still, in order to ensure that the mood induction did not influence our main effects or interactions in the multivariate context, we created dummy coded mood condition variables (one representing the contrast between negative and neutral, and a second representing the contrast between positive and neutral mood conditions) and included these dummy codes in all substantive analyses.

A series of autoregressive models were run to test TR expectancies as a unique predictor of post-consumption mood, controlling for pre-consumption mood (PANAS) in addition to mood induction condition. BAC also was controlled, as mood effects of alcohol may differ by intoxication level (Robbins & Brotherton, 1980). We chose to control BAC, as opposed to amount of alcohol consumed, as BAC gives a better index of drinking to impairment. Further, to isolate the unique contribution of TR expectancies on mood, all three other types of positive expectancies (Liquid Courage, Sociability, Sexuality) were included in the models. Each regression model included one of two dependent variables: positive PANAS or negative PANAS score. Hypotheses were based on our interest in the importance of negative affect to problem drinking; positive affect was tested in a more exploratory manner.

Main Effects of Expectancies

First, we tested our primary hypothesis that TR expectancies would uniquely predict post-drinking mood. When positive PANAS was the dependent variable, TR expectancies were not significant in any of the main effects or moderational models. Interestingly, and contrary to hypotheses, higher TR expectancies were *positively* (marginally) related to negative mood after drinking (β =.13, p =.08), suggesting that those with stronger beliefs about alcohol's ability to reduce negative mood in fact experienced *more* negative affect post-drinking. Though not hypothesized, higher Sociability expectancies were marginally negatively associated with negative post-drinking PANAS scores (β = −.16, p = .07), suggesting a trend for stronger endorsement of beliefs regarding alcohol's ability to facilitate social interaction

to be associated with less negative affect post-drinking. See Table 2 for a summary of models predicting negative mood.

Moderation by BAC

Following procedures outlined by Aiken and West (1991), we tested whether participants' in-lab BAC moderated TR expectancy associations with mood. All independent variables were centered prior to creating interaction terms, and centered variables were included in models to test interactions. The interaction between TR expectancy and BAC was marginally significant (β = −.13, p =.08) when negative PANAS was the outcome. Because this marginal interaction was both theoretically based and hypothesized *a priori*, it was probed using simple slopes analyses. Prior to running regression models to test simple slopes (i.e., the association between TR expectancies and post-drinking mood within the context of high versus low in-lab BACs), new variables were created to represent high and low values of the proposed moderators by subtracting and adding one standard deviation from each participant's value on the moderator (Aiken & West, 1991)[1]. All models probing interactions in the present study included the same covariates used in initial models (i.e., BAC, all expectancy types). Here we observed that in the context of achieving a low in-lab BAC, TR expectancies were positively and significantly associated with negative post-drinking mood (β =.27, p = .01). This association was non-significant in the context of high in-lab BACs (Figure 1)[2].

Moderation by Alcohol Involvement Indices

Next, we examined whether three unique domains of alcohol involvement (years drinking regularly, typical quantity, heavy episodic drinking frequency) moderated associations between TR expectancies and post-consumption mood. No significant interactions were observed for either positive or negative mood post-consumption (See Table 2). However, following *a priori* hypotheses, associations between TR expectancies and negative mood were probed at high and low levels of each moderator.

Years Regular Drinking—In the context of drinking regularly for fewer years, higher TR expectancies were associated with *higher* negative mood after drinking (β =.20, p =.04; Figure 2). That is, individuals with less drinking experience who expected drinking to reduce negative mood actually experienced more negative mood. Regarding a longer history of regular drinking, TR expectancies were not associated with negative mood post-drinking (β = .02, p =.88).

Typical Drinking Quantity—Similarly, in the context of lower typical quantity, TR expectancies were significantly associated with negative post-drinking mood (β = .19, p =. 05). TR expectancies were not significantly associated with negative mood after drinking (β = .03, p = .77) in the context of higher alcohol quantities.

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[1]For example, the standard deviation of BAC was .02; thus, a variable to represent high BAC was created by subtracting .02 from every participant's actual BAC score. Because all independent variables were centered, whereas zero originally was the mean score on the centered BAC variable, this subtraction of a standard deviation shifts the distribution of the variable to the left, so that zero then represents high (+1 SD) values of BAC. Similarly, a variable to represent low BAC was created by adding .02 to each participant's BAC score, thus shifting the mean of the centered BAC score so that 0 would represent low values.

[2]Because BAC continued to increase for some participants (n=22) after the initial reading, we reran all analyses controlling for *maximum* BAC that was recorded for each participant (i.e., the highest BAC reading across all 15-minute intervals), as opposed to the first BAC measurement that was taken. We also re-examined the BAC by TR expectancies interaction using the *maximum* BAC. Though this measurement has the advantage of better indicating the eventual highest level of intoxication, for some participants this measurement also was farther from the time of their post-drinking mood assessment. Nonetheless, there were no substantive differences in the magnitude, significance, or pattern of our findings in these follow-up analyses, either when using maximum BAC as a covariate, or when testing its interaction with TR expectancies.

Heavy Episodic Drinking Frequency—Consistent with the previous two findings, for simple slopes of less frequent heavy episodic drinking, TR expectancies were associated with higher negative mood ($\beta = .19$, $p = .03$). But, for more frequent heavy episodic drinking, higher TR expectancies were not significantly associated with negative mood ($\beta = .02$, $p = .89$).

Discussion

This study provided a test of social-learning-based hypotheses regarding the relationship between expectations for mood effects and actual mood outcomes following drinking. Findings provided mixed support for a social learning conceptualization of this association. We observed that mood-relevant (i.e., Tension Reduction) expectancies had a unique influence on the experience of negative mood following alcohol use. We also found evidence that this association was influenced by individual differences; stronger TR expectancy-negative mood associations were observed for those with less drinking experience, and those achieving lower BACs. Though the direction of these moderational findings was not hypothesized, confidence in observed effects is bolstered by the fact that the probed simple slopes were consistent across multiple alcohol experience indices. Moreover, our regression analyses included both in-lab BAC and all positive expectancy types. This represents a very stringent test of the unique effect of negative mood (TR) expectancies on post-drinking mood. Together, our results shed light on the complex link between expectations for mood while drinking, and real drinking outcomes.

Main Effects: Mood Expectations and Post-Drinking Mood

Our SLT-based hypothesis that TR expectancies would predict less negative affect following consumption was not supported. Instead we found discrepancies between pre-drinking expectations and post-drinking outcomes. Though not evident in bivariate correlations, TR expectancies were marginally associated with *higher* negative mood in the multivariate context of the regression analysis, when shared variance with other expectancy types irrelevant to the prediction of post-drinking mood was controlled. Our data also suggested that higher sociability expectancies predicted less negative mood post-drinking, as we observed a marginal association between this expectancy type and post-drinking negative mood. This effect may be understood by considering third variables such as temperamental predisposition (e.g., extraversion, trait positive affectivity). That is, those individuals who hold the belief that alcohol will make them more sociable, talkative, or energetic might be those same individuals who generally are higher on positive affect and/or lower on negative affect, explaining their lower negative mood post-consumption.

The unexpected finding that high expectancies for alcohol's ability to reduce negative mood predicted high negative mood following drinking may reflect the fact that individuals who had high hopes for alcohol's effects were particularly disappointed or distressed when these effects were not realized. Findings from moderation analyses (below) are consistent with this interpretation.

The finding that TR expectancies predicted low negative mood post-drinking is more consistent with expectancy theory (e.g., Bolles, 1972) than with a Social Learning conceptualization, and pertains to the persistence of expectancies once they have been learned. Our sample was comprised of regular to heavy drinking college students, who endorsed TR expectancies and also reported a recent history of heavy drinking despite in-lab evidence that these expectations for alcohol are not met. Thus, it may be that rather than experience with alcohol shaping expectations for future effects as is posited as part of SLT, expectancies may instead predict alcohol use independent of actual experience with alcohol. Another perhaps more likely interpretation is that these processes are not simplistic, and that

an array of factors in addition to both expectations and actual effects drive continued drinking. Evidence for this final interpretation is well illustrated in our findings regarding moderation by individual difference factors.

Moderating Factors: Individual-Level Differences in Expectancy-Mood Associations

Perhaps the most interesting finding to emerge in our data was the evidence for some role of personal experience in the association between expectancies and subjective outcomes. Differences were observed in the relationship between expectations for alcohol's negative mood effects and actual post-drinking mood for three related but independent indices of alcohol involvement. Interestingly, stronger TR expectancies predicted higher negative mood after drinking for less-experienced drinkers. Perhaps less-involved drinkers were less devoted to their beliefs that alcohol will enhance mood. As a result, they instead exhibited the mood that one could imagine might result from drinking alcohol alone in a laboratory setting – a slight increase in negative affect. It also is possible that students with less experience with alcohol but with high TR expectancies may have experienced negative affect *in response* to the failure of alcohol to produce anticipated outcomes.

On the other hand, more experienced drinkers with high TR expectancies did not exhibit this same reaction. This pattern too was observed across three indices of drinking experience. Repeated pairings of alcohol use and perceived positive effects of alcohol may have strengthened expectancies in those who drink more often or have been drinking for more years. These drinkers may be more committed to their beliefs about the reinforcing properties of alcohol, and perhaps as a result, we did not observe the same negative association between TR beliefs and high negative affect that was evident for less experienced drinkers.

Again, other interpretations are possible. First, tolerance may play a role; these heavier drinkers may require more alcohol in order to achieve expected mood-altering effects. Second, as alcohol expectancies are not uniformly positive, particularly among lighter drinkers (Read et al., 2009), *negative* expectancies may have interacted with positive beliefs about alcohol's ability to influence mood, resulting in an unexpected negative association between TR expectancies and negative mood in less-experienced drinkers. Lastly, and as mentioned previously, third variables such as temperament or personality may play a role in pathways by which expectancies may be translated into post-drinking mood outcome. For example, individuals more prone to negative affect may also be those more likely to report both expectations that alcohol will alleviate negative mood and more actual subjective negative mood in-lab. Future examination of the role of temperamental predispositions to affective states will build on findings observed here.

Thus our data regarding the role of experience in relation to expectancies did not fully support the social learning conceptualization that initially informed our study hypotheses. As has been suggested by Sher and colleagues (1996), whereas the bidirectional influences between expectancies and alcohol use that are proposed by SLT may explain the early formation of positive expectancies and alcohol use patterns, different theories may be needed to understand the role of expectancies in the *continued* use that occurs for regularly to heavy drinking college students. Expectancies may not simply be the product of learning through direct associative experience, as SLT suggests, particularly once drinking patterns have become established. Instead, over time, these expectancies may become more ingrained as a stable aspect of an individual's belief system, and less malleable to the influence of subsequent experiences.

A final observation from this study is that the effect of TR expectancies on negative mood was influenced by level of in-lab intoxication; it was only for those with lower BACs that

higher TR expectancies predicted negative mood. The positive association between TR expectancies and negative mood in more intoxicated drinkers again may be a function of tolerance, particularly given that we observed a significant positive correlation between self-reported typical quantity of consumption and in-lab BAC. Examination of expectancies and subjective effects at higher alcohol doses than those in the present study will be an interesting future direction for research in this area.

In summary, though some of our findings were consistent with a social learning framework, others were not. This underscores the complexity of expectancy processes that may contribute to continued drinking, especially in circumstances where expectancies for and realities of alcohol's effects diverge. This is particularly true in light of findings that many individual- and contextual-level factors influence expectancies (e.g., Read, Lau-Barraco, Dunn & Borsari, 2009), and that heavier drinkers and those with more positive expectations for alcohol's effects generally interpret drinking occasions more positively (e.g., Dunn & Goldman, 1998; Holdstock et al., 2000). Moreover, current theories typically focus only on associations between expectancies and drinking behavior, and do little to integrate of the role of actual drinking outcomes relative to expectancies, which our data clearly suggest are discrepant at least for some drinkers.

Limitations and Future Directions

The present study has limitations pointing to directions for future work. Failure to observe statistical significance of main and interactive effects in the present study may be due to the strong autoregressive effects and stringent nature of our tests (i.e., several control variables). Further, the internal consistency of the TR scale in this study was .63. Loewenthal (1996) asserts that that Cronbach's $\alpha > .60$ reflects adequate reliability for scales with less than 10 items. Still, as power to detect interaction effects is generally lower than that to detect main effects (Aiken & West, 1991), our power to detect interactive effects of interest was especially limited. Future studies will benefit from larger sample sizes and/or use of a more reliable measure of TR expectancies.

Further, in the present study, while our sample size allowed us power to detect medium effect sizes (power = .86 to detect $f^2 = .15$, Cohen, 1988), our observed effect sizes for both main effects and interactions were small (all $f^2 < .025$). These small effect sizes could be a function of the context of our study – drinking took place in the lab setting, which, as noted earlier, may not closely approximate real world drinking and its correlates. Alternatively, it could be that these associations simply are not large in magnitude, which has both clinical and theoretical implications. From an applied standpoint, a minimal effect of mood expectations on actual post-drinking mood suggests that negative mood outcomes may not have much of an impact on shaping future expectancies or future drinking behaviors. In terms of theoretical implications, as noted, the nature and magnitude of these associations implies that classic learning formulations may not readily explain the formation of expectancies and their association with drinking behavior.

Though not of interest to the present research questions, of note are the non-significant bivariate associations between positive alcohol expectancy types and alcohol use variables. These likely are a function of the relatively heavy drinking nature of our sample, and resultant limited variability in both alcohol use levels and expectancies of these individuals. Thus, it must be kept in mind that the present findings likely are best generalized to heavy drinking college students. Still, as it is for these at-risk students that targeted interventions are needed, it is arguably most essential to understand the mechanisms that reinforce heavy rather than light or moderate drinking.

Students in the present sample reported only low levels of negative affect (see Table 1). Experimental examination of expectancy-mood links in individuals targeted for higher negative affect levels (e.g., clinical samples) will help delineate the role of TR expectancies in the prediction of significant subjective distress. Moreover, as with any study, there may have been unmeasured interaction effects that might predict post-consumption mood. For example, though we controlled for mood condition in our study, observing no effects of mood condition on our findings, for reasons having to do with statistical power and theoretical rationale, we chose not to include tests of interactions between mood condition and any other model variables.

We observed specific effects of TR expectancies on only the negative PANAS scores, suggesting that it is those expectancies relevant to a particular mood (rather than positive expectancies broadly) that are most closely linked to actual mood. In this study, we were primarily interested in negative mood expectations and outcomes. Future research will build on the present study with examination of expectancies for the alcohol-induced positive affect, and whether such expectancies correspond to higher positive mood post-drinking.

Summary and Conclusions

In sum, our findings represent a step closer to clarifying the intricate processes that may shape college students' beliefs about alcohol and their drinking behaviors. Our data suggest that expectations for alcohol's effects are *not* necessarily reality, particularly for those with little drinking experience. Though our findings do not support the emphasis that SLT places on direct learning from alcohol's effects, they do support the notion that direct learning (i.e., past drinking experience) may at least minimize discrepancies between expectancies and actual mood outcomes. As BAC and three separate indices of level of experience with alcohol emerged as being important in moderational tests, findings suggest that individual difference factors should be considered when invoking theory to explain the association between expected and actual effects of alcohol. Moreover, our data add to a growing body of literature that points to a need for both research and theories that integrate and seek to understand the complex array of factors that may explain the persistence of heavy drinking.

In light of our findings, interventions may be enhanced by consideration of how past drinking experiences have shaped expectations for future drinking. Further, our findings could be incorporated into individualized interventions (e.g., motivational, expectancy-based interventions) highlighting differences between alcohol's perceived and actual effects. As discrepancies were observed for less experienced drinkers in particular, early intervention when expectancies are less ingrained and perhaps more readily modified may be important.

Acknowledgments

References

Aiken, LS.; West, SG. Multiple regression Testing and interpreting interactions. Newbury Park, CA: Sage; 1991.

Bandura, A. Social Learning Theory. Englewood Cliffs, NJ: Prentice-Hall; 1997.

Bauman KE, Fisher LA, Bryan EES. Relationships between subjective expected utility and behavior: A longitudinal study of adolescent drinking behavior. Journal of Studies on Alcohol. 1985; 46:32–38. [PubMed: 3974233]

Bem, DJ. Self-perception theory. In: Berkowitz, L., editor. Cognitive theories in social psychology. New York: Academic Press; 1978. p. 221-282.

Bolles RC. Reinforcement, expectancy, and learning. Psychological Review. 1972; 79:394–409.

Bolon K, Barling J. Alcohol, expectancies, sex and social setting effects on depression. South African Journal of Psychology. 1980; 10:46–49.

Brown SA. Expectancies versus background in the prediction of college drinking patterns. Journal of Consulting and Clinical Psychology. 1985; 53:123–130. [PubMed: 3980817]

Burden JL, Maisto SA. Expectancies, evaluations and attitudes: Prediction of college student drinking behavior. Journal of Studies on Alcohol. 2000; 61:323–331. [PubMed: 10757144]

Carey KB, Correia CJ. Drinking motives predict alcohol-related problems in college students. Journal of Studies on Alcohol. 1997; 58:100–105. [PubMed: 8979218]

Carpenter KM, Hasin DS. A perspective evaluation of the relationship between reasons for drinking and DSM-IV alcohol-use. Addictive Behaviors. 1998; 23:41–46. [PubMed: 9468741]

Carpenter KM, Hasin DS. Reasons for drinking alcohol: Relationships with DSM-IV alcohol diagnoses and alcohol consumption in a community sample. Psychology of Addictive Behaviors. 1998; 12:168–184.

Center for the Psychophysiological Study of Emotion and Attention. The International Affective Picture System. Gainesville, FL: Center for Research in Psychophysiology, University of Florida; 1994.

Chutuape MAD, De Wit H. Relationship between subjective effects and drug preferences: Ethanol and diazepam. Drug and Alcohol Dependence. 1994; 34:243–251. [PubMed: 8033763]

Cohen, J. 2nd Edition. New Jersey: Hillsdale: Lawrence Erlbaum Associates; 1988. Statistical power analysis for the behavioral sciences.

Conger JJ. Alcoholism: Theory, problem and challenge: II Reinforcement theory and the dynamics of alcoholism. Journal of Studies on Alcohol. 1956; 17:296–305.

Conger JJ. The effects of alcohol on conflict behavior in the albino rat. Journal of Studies on Alcohol. 1951; 12:1–29.

Cooper ML, Agocha VB, Sheldon MS. A motivational perspective on risky behaviors: The role of personality and affect regulatory processes. Journal of Personality. 2000; 68:1059–1088. [PubMed: 11130732]

Cooper ML. Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence. Journal of Studies on Alcohol. 2002; 14:101–117.

Corcoran KJ. Predicting reduction in tension following alcohol consumption in a stressful situation with the alcohol expectancy questionnaire. Addictive Behaviors. 1994; 19:57–62. [PubMed: 8197893]

de Wit H, Uhlenhuth EH, Pierri J. Individual differences in behavioral and subjective responses to alcohol. Alcoholism-Clinical and Experimental Research. 1987; 11:51–59.

Duka T, Tasker R, Stephens DN. Alcohol choice and outcome expectancies in social drinkers. Behavioural Pharmacology. 1998; 9:643–653. [PubMed: 9862089]

Dunn ME, Goldman MS. Empirical modeling of an alcohol expectancy network in elementary-school children as a function of grade. Experimental and Clinical Psychopharmacology. 1996; 4:209–217.

Dunn ME, Yniguez RM. Experimental demonstration of the influence of alcohol advertising on the activation of alcohol expectancies in memory among fourth-and fifth-grade children. Experimental and Clinical Psychopharmacology. 1999; 7:473–483. [PubMed: 10609982]

Earlywine M, Martin CS. Anticipated stimulant and sedative effects of alcohol vary with dosage and limb of the blood alcohol curve. Alcoholism-Clinical and Experimental Research. 1993; 17:135–139.

Fromme K, Dunn ME. Alcohol expectancies, social and environmental cues as determinants of drinking and perceived reinforcement. Addictive Behaviors. 1992; 17:167–177. [PubMed: 1585843]

Fromme K, Stroot E, Kaplan D. Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. Psychological Assessment. 1993; 5:19–26.

Frone MR. Are work stressors related to employee substance use? The importance of temporal context assessments of alcohol and illicit drug use. Journal of Applied Psychology. 2008; 93:199–206. [PubMed: 18211145]

Goldman MS, Brown SS, Christiansen BA. Alcoholism etiology and memory: Broadening the scope of alcohol expectancy research. Psychological Bulletin. 1991; 110:137–146. [PubMed: 1891515]

Goldman, MS.; Brown, SS.; Christiansen, BA. Expectancy theory: Thinking about drinking. In: Leonard, KE.; Blane, HT., editors. Psychological Theories of Drinking and Alcoholism. New York: Guilford Press; 1987. p. 181-226.

Goldman, MS.; Rather, BC. Substance abuse: Cognitive models and architecture. In: Kendal, PC.; Dobson, K., editors. Psychopathology and Cognition. New York: Academic Press; 1993. p. 245-292.

Greeley, J.; Oei, T. Alcohol and Tension Reduction. In: Leonard, KE.; Blane, HT., editors. Psychological Theories of Drinking and Alcoholism. 2nd edition. New York: Guilford Press; 1999. p. 14-53.

Guarna J, Rosenberg H. Influence of dose and beverage type instructions on alcohol outcome expectancies of DUI offenders. Journal of Studies on Alcohol. 2000; 61:341–344. [PubMed: 10757146]

Holdstock L, King AC, De Wit H. Subjective and objective responses to ethanol in moderate/heavy and light social drinkers. Alcoholism-Clinical and Experimental Research. 2000; 24:789–794.

Hussong AM, Hicks RE, Levy SA. Specifying the relations between affect and heavy alcohol use among young adults. Journal of Abnormal Psychology. 2001; 110:449–461. [PubMed: 11502088]

Kassel JD, Jackson SI, Unrod M. Generalized expectancies for negative mood regulation and problem drinking among college students. Journal of Studies on Alcohol. 2000; 61:332–340. [PubMed: 10757145]

Kline, RB. Principles and practice of structural equation modeling. 2nd ed.. New York: Guilford; 2005.

Knight JR, Wechsler H, Kuo M. Alcohol abuse and dependence among U.S. college students. Journal of Studies on Alcohol. 2002; 63:332–340.

Kuo M, Adlaf EM, Lee H. More canadian students drink but american students drink more: Comparing college alcohol use in two countries. Addiction. 2002; 97:1583–1592. [PubMed: 12472642]

Levenson RW, Sher KJ, Grossman LM, Newman J, Newlin DB. Alcohol and stress response dampening: Pharmacological effects, expectancy, and tension reduction. Journal of Abnormal Psychology. 1980; 89(4):528–538. [PubMed: 7400453]

Loewenthal, KM. An introduction to psychological tests and scales. London: UCL Press Limited; 1996.

Maisto, SA.; Carey, KB.; Bradizza, CM. Social learning theory. In: Blane, HT.; Leonard, KE., editors. Psychological theories of drinking and alcoholism. New York: Guilford; 1999. p. 106-163.

Marlatt, GA. Alcohol, stress, and cognitive control. In: Sarason, JG.; Spielberger, CD., editors. Stress and anxiety. Vol. Vol. 3. Washington, D.C: Hemisphere Publishing Corp; 1976. p. 271-296.

Pliner P, Cappell H. Modification of affective consequences of alcohol: A comparison of social and solitary drinking. Journal of Abnormal Psychology. 1974; 83:418–425. [PubMed: 4414699]

Rather BC, Goldman MS. Drinking-related differences in memory organization of alcohol expectancies. Experimental and Clinical Psychopharmacology. 1994; 2:167–183.

Read JP, Lau-Barraco C, Dunn ME, Borsari B. Projected Alcohol Dose Influences on the Activation of Alcohol Expectancies in College Drinkers. Alcoholism: Clinical and Experimental Research. 2009; 33:1265–1277.

Read JP, O'Connor RM. High- and low-dose expectancies as mediators of personality dimensions and alcohol involvement. Journal of Studies on Alcohol. 2006; 67:204–214. [PubMed: 16562402]

Read JP, Wood MD, Kahler CW. Examining the role of drinking motives in college student alcohol use and problems. Psychology of Addictive Behaviors. 2003; 17:13–23. [PubMed: 12665077]

Robbins BJ, Brotherton PL. Mood change with alcohol intoxication. British Journal of Clinical Psychology. 1980; 19:149–155.

Rohsenow DJ, Marlatt GA. The balanced placebo design: Methodological considerations. Addictive Behaviors. 1981; 6:107–122. [PubMed: 7023202]

Sayette MA, Breslin C, Wilson T, Rosenblum GD. Parental history of alcohol abuse and the effects of alcohol and expectations of intoxication on social stress. Journal of Studies on Alcohol. 1992; 55:214–223. [PubMed: 8189742]

Sher KJ, Walitzer KS. Individual differences in the stress-response-dampening effects of alcohol: A dose-response study. Journal of Abnormal Psychology. 1986; 95:15–167. [PubMed: 3700842]

Sher KJ, Wood MD, Wood PK. Alcohol outcome expectancies and alcohol use: A latent variable cross-lagged panel study. Journal of Abnormal Psychology. 1996; 105:561–574. [PubMed: 8952189]

Smith GT, Goldman MS, Greenbaum PE. The expectancy for social facilitation from drinking: The divergent paths of high-expectancy and low-expectancy adolescents. Journal of Abnormal Psychology. 1995; 104:32–40. [PubMed: 7897051]

Sobell, LC.; Sobell, M. Timeline follow-back: A technique for assessing self-reported alcohol consumption. In: Litten, RZ.; Allen, JP., editors. Measuring alcohol consumption: Psychosocial and biochemical methods. Totowa, NJ: Humama Press, Inc; 1992. p. 41-72.

Tabachnick, B.; Fidell, L. Using multivariate statistics. 4th ed.. Boston, MA: Allyn and Bacon; 2001.

Vogel-Sprott, M.; Fillmore, MT. Learning theory and research. In: Leonard, KE.; Blane, HT., editors. Psychological theories of drinking and alcoholism. 2nd ed.. New York, NY: Guilford Press; 1999. p. 328-371.

Vuchinich RE, Tucker JA. Contributions from behavioral theories of choice to an analysis of alcohol abuse. Journal of Abnormal Psychology. 1988; 97:181–195. [PubMed: 3133403]

Wall AM, Thrussell C, Lalonde RN. Do alcohol expectancies become intoxicated outcome? A test of social-learning theory in a naturalistic bar setting. Addictive Behaviors. 2003; 28:1271–1283. [PubMed: 12915168]

Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology. 1988; 54:1063–1070. [PubMed: 3397865]

Wechsler H, Lee J, Kuo M. College binge drinking in the 1990s: A continuing problem: Results of the Harvard School of Public Health 1999 College Alcohol Study. Journal or American College Health. 2000; 48:199–210.

Wood MD, Nagoshi CT, Dennis DA. Alcohol norms and expectations as predictors of alcohol use and problems in a college student sample. American Journal of Drug and Alcohol Abuse. 1992; 18:461–476. [PubMed: 1449125]

Young R, McDoei TPS. The predictive utility of drinking refusal self-efficacy and alcohol expectancy: A diary-based study of tension reduction. Addictive Behaviors. 2000; 25:415–421. [PubMed: 10890294]

Figure 1.
Simple slopes of associations between tension reduction (TR) expectancies and post-drinking negative PANAS scores in those with high versus low blood alcohol concentration (BAC).
Note: Range of potential scores on the PANAS is 10–50.
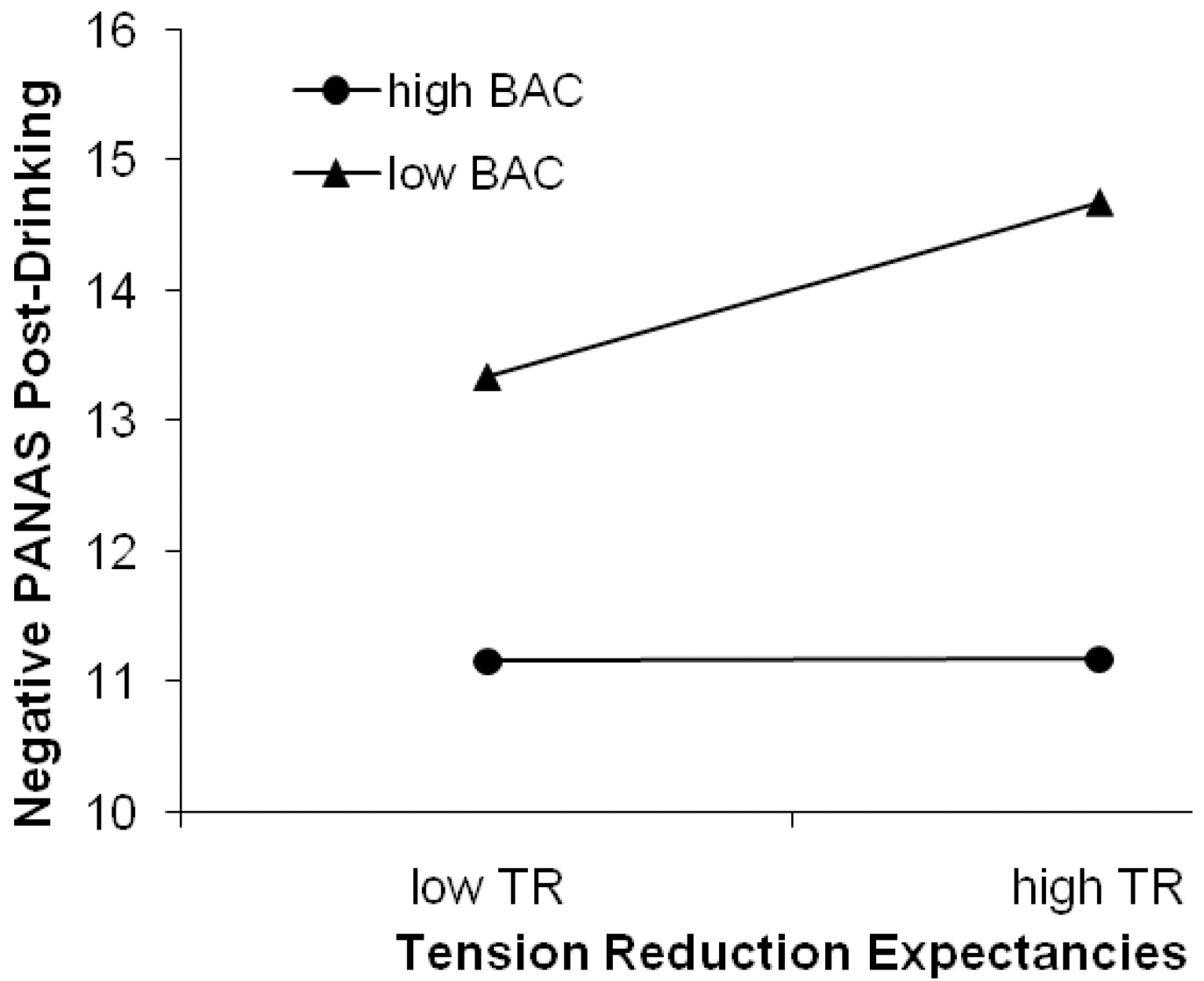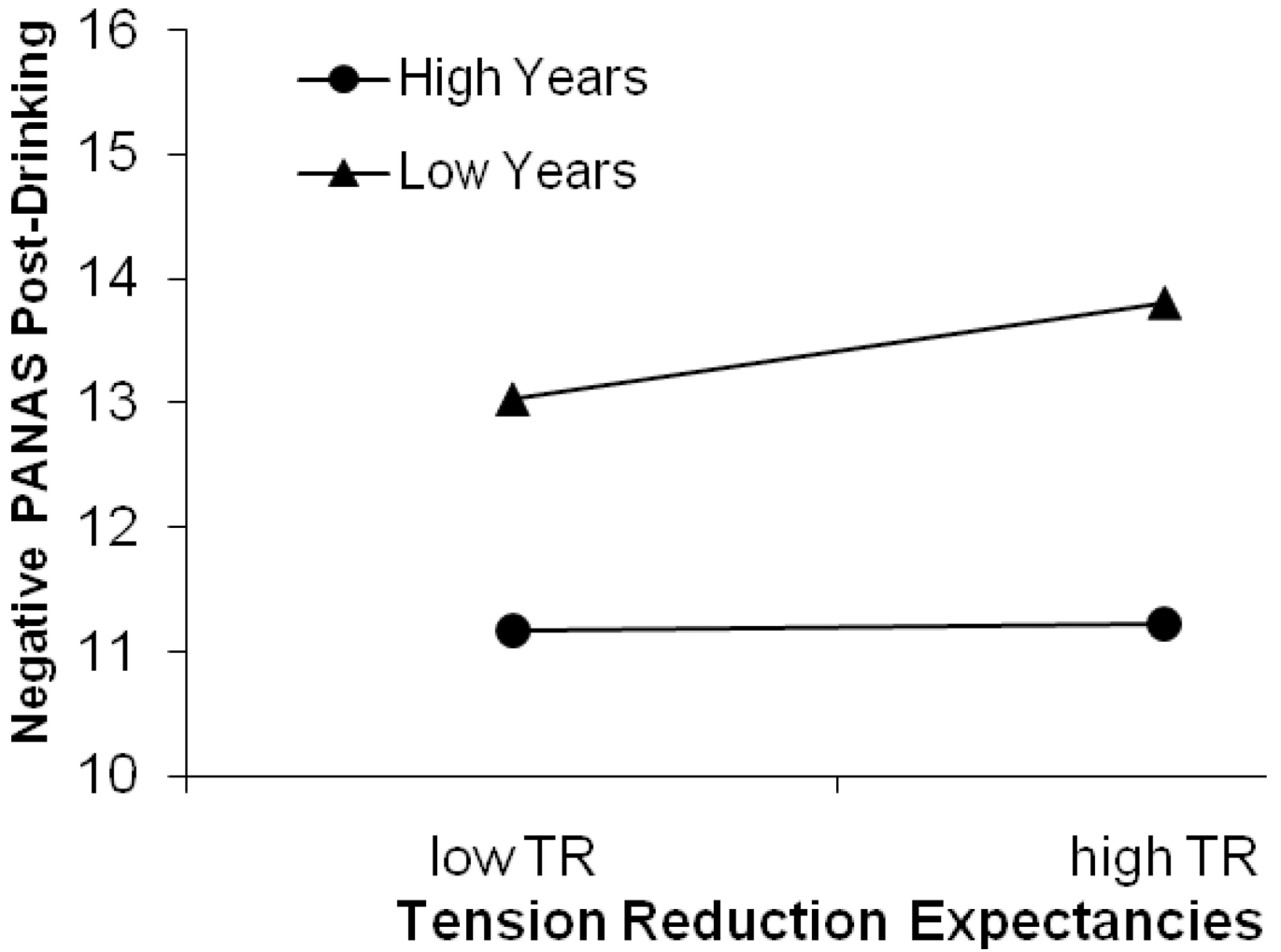
Figure 2.
Simple slopes of associations between tension reduction (TR) expectancies and post-drinking negative PANAS scores in those with a high versus low number of years as a regular drinker.
Note: As the nature of simple slopes for both quantity and frequency of heavy episodic drinking was similar to that for years regular drinking, separate figures for each test are not depicted.

Table 1

Intercorrelations, Means, Standard Deviations of Model Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	M	SD
1. TR	1														8.78	1.66
2. SOC	.25**	1													26.45	4.12
3. LC	.31***	.56***	1												13.66	3.22
4. SEX	.18*	.48***	.54***	1											10.26	3.02
5. BAC	.06	.02	.08	.06	1										.03	.02
6. Years	-.06	.11	.21*	.12	.24**	1									4.08	1.86
7. Quant	-.02	.05	.11	.01	.29***	.51***	1								17.38	10.88
8. Heavy	-.02	.14	.11	.06	.23**	.41***	.89***	1							6.95	4.21
9. Base NEG	-.04	.08	.10	.06	-.12	.03	-.01	-.05	1						11.61	2.37
10. Post NEG	.08	-.06	.03	.02	-.16*	-.11	-.08	-.09	.55***	1					11.18	1.87
11. Base POS	.00	-.02	.01	.04	-.002	-.14	-.02	-.07	.17*	.11	1				24.87	7.58
12. Post POS	.03	.09	.13	.10	.03	-.14	-.02	-.05	.16	.08	.83***	1			24.91	8.19
13. PosVs.Neu	.04	-.12	-.04	-.06	.11	-.08	.01	-.01	-.01	.05	.01	-.01	1		.32	.47
14. NegVsNeu	.11	.09	.12	.16*	.03	-.01	.01	.07	.04	.01	-.04	.00	-.50***	1	.34	.48

Notes: TR = Tension Reduction expectancies, SOC = Sociability expectancies, LC = Liquid Courage expectancies, SEX = Sexuality expectancies, BAC = Blood alcohol concentration, Years = Years as a regular drinker, Quant = Typical Quantity, Heavy = Past Month Heavy Episodic Frequency, Base NEG = baseline negative affect, Post NEG = post consumption negative affect, Base POS = baseline positive affect, Post POS = post consumption positive affect, .PosVs.Neu = Dummy coded variable for positive versus neutral mood conditions, NegVs.Neu = Dummy coded variable for negative versus neutral mood conditions;

*
p<.05,

**
p<.01,

***
p<.001.

Table 2

Regression Analysis Summary for Tension Reduction (TR) Expectancies and Interaction Terms Predicting Post-Consumption Negative PANAS

Variable	B	SEB	β	F	df	Adjusted R^2
Model 1				9.03**	(8, 136)	.31
Baseline Negative Mood	.44	.06	.55**			
BAC	−8.23	5.35	−.11			
Neg vs. Neu	−.00	.32	−.00			
Pos vs. Neu	.18	.32	.05			
TR Expectancies	.15	.08	.13†			
SOC Expectancies	−.07	.04	−.16†			
LC Expectancies	.01	.05	.02			
SEX Expectancies	.03	.05	.04			
Model 2				8.51**	(9, 135)	.32
Baseline Negative Mood	.44	.06	.56**			
BAC	−7.64	5.31	−.10			
Neg vs. Neu	−.04	.32	−.01			
Pos vs. Neu	.14	.33	.04			
TR Expectancies	.21	.09	.14†			
SOC Expectancies	−.07	.04	−.16†			
LC Expectancies	−.01	.05	−.02			
SEX Expectancies	.03	.05	.05			
BAC x TR Expectancies	−6.00	3.35	−.13†			
Model 3				7.65**	(10, 134)	.32
Baseline Negative Mood	.44	.06	.56**			
BAC	−6.54	5.50	−.09			
Neg vs. Neu	−.04	.32	−.01			
Pos vs. Neu	.14	.33	.03			
TR Expectancies	.12	.08	.11			
SOC Expectancies	−.07	.04	−.17†			

Variable	B	SEB	β	F	df	Adjusted R^2
LC Expectancies	.02	.05	.03			
SEX Expectancies	.02	.05	.04			
Years	–.10	.07	–.10			
Years x TR Expectancies	–.05	.04	–.09			
Model 4				7.32**	(10, 134)	.31
Baseline Negative Mood	.44	.06	.55**			
BAC	–7.48	5.60	–.10			
Neg vs. Neu	.00	.32	.00			
Pos vs. Neu	.19	.33	.05			
TR Expectancies	.13	.08	.12			
SOC Expectancies	–.08	.04	–.17*			
LC Expectancies	.02	.05	.03			
SEX Expectancies	.02	.05	.03			
Quant	–.01	.01	–.05			
Quant x TR Expectancies	–.01	.01	–.07			
Model 5				7.37**	(10,134)	.31
Baseline Negative Mood	.44	.06	.55**			
BAC	–8.62	5.51	–.11			
Neg vs. Neu	–.00	.32	–.00			
Pos vs. Neu	.20	.33	.05			
TR Expectancies	.12	.09	.10			
SOC Expectancies	–.08	.04	–.17†			
LC Expectancies	.01	.05	.02			
SEX Expectancies	.02	.05	.04			
Heavy	–.00	.03	–.01			
Heavy x TR Expectancies	–.02	.02	–.09			

Notes: N = 145,

**
p<.0001,

*
p<.05,

[†]p<.10;

BAC = Blood alcohol concentration, TR = Tension Reduction, SOC = Sociability, LC = Liquid Courage, SEX = Sexuality, Years = Years as a regular drinker, Quant = Typical Quantity, Freq = Typical Frequency, Heavy = Frequency of Heavy Episodic Drinking Episodes; PosVs.Neu = Dummy coded variable for positive versus neutral mood conditions, NegVs.Neu = Dummy coded variable for negative versus neutral mood conditions.